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ABSTRACT

This module, which is one in a series of 29 competency-based administrator education learning packages and related supportive materials focusing upon specific professional competencies of vocational administrators, deals with integrating academic and vocational-technical education. The first section discusses the need to integrate academic and vocational-technical education. In the second section, the following aspects of integrating academic and vocational-technical education are discussed: selecting and using strategies for successful integration, laying the foundation for and conceptualizing the nature and parameters of the intended change, preparing to implement the integration process, actually implementing the change process, evaluating the integration program, and maintaining an ongoing program evaluation and improvement process. The third part describes selected models for integrating academic, math, science, artistic, and practical skills that have been successful in the following locations: Arkansas, Massachusetts, Kentucky, Pennsylvania, Ohio, Oregon, and West Germany. Each of these program descriptions contains a program title, program description, and address from which to obtain additional information. (MN)

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Integration of Academic and Vocational-Technical Education: An Administrator's Guide

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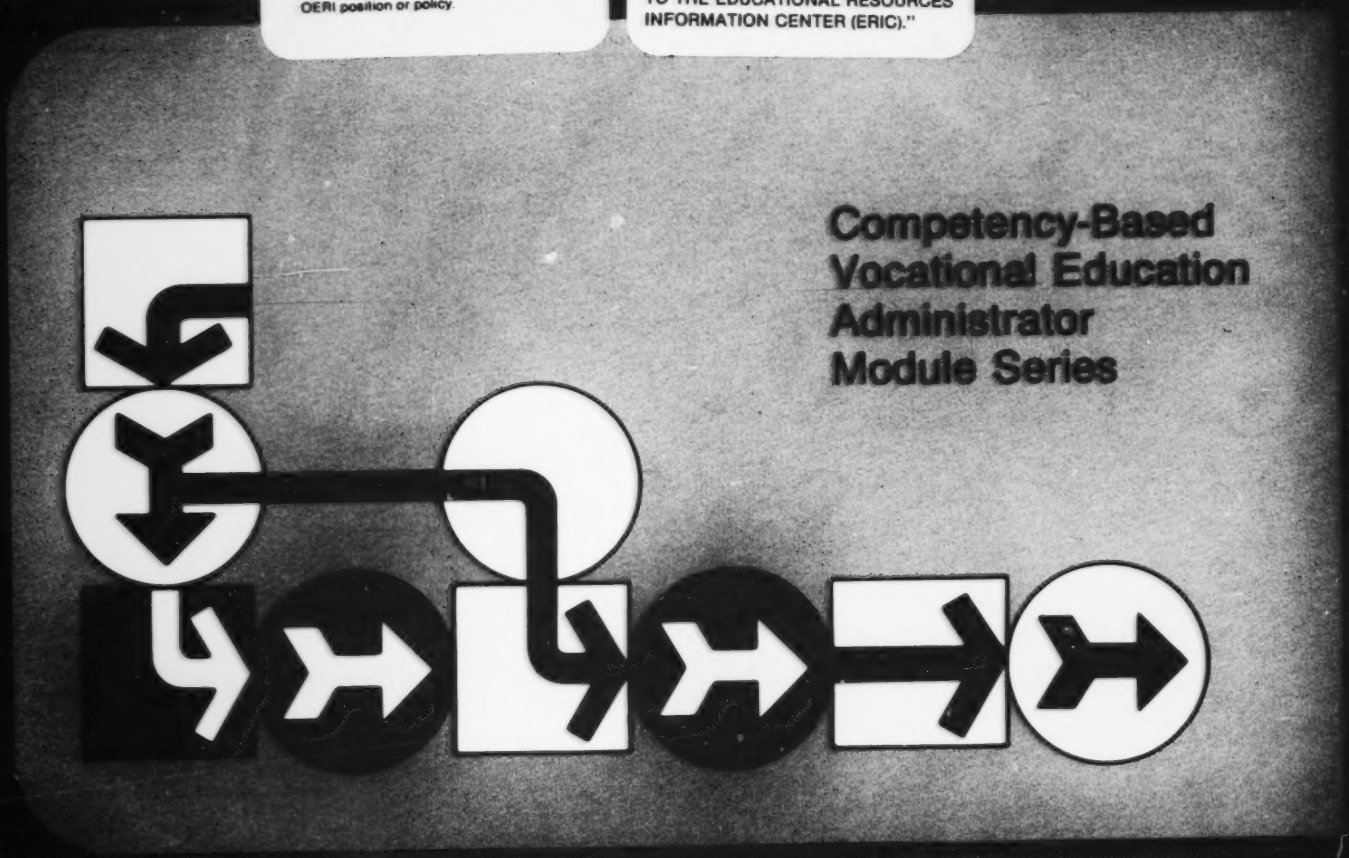

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Integration of Academic and Vocational-Technical Education: An Administrator's Guide

COMPETENCY-BASED VOCATIONAL EDUCATION ADMINISTRATOR MODULE SERIES

Consortium for the Development of
Professional Materials for Vocational Education

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FOREWORD

The need for competent administrators of vocational education has long been recognized. Preservice and inservice administrators at both the secondary and postsecondary levels need to be well prepared for the complex and unique skills required to successfully direct vocational programs.

The effective training of local administrators has been hampered by the limited availability of high-quality competency-based materials specifically designed for the preparation of vocational administrators. In response to this need, work began in 1975, under U.S. Office of Education sponsorship, to identify the competencies important to successful administrators and to develop modularized training materials that would address the competencies. This work continued in September of 1978 when seven states joined with the National Center for Research in Vocational Education to form the Consortium for the Development of Professional Materials for Vocational Education. These combined efforts resulted in the development, field testing, and publication of the initial twenty-nine modules and three supportive documents in the Competency-Based Vocational Administrator Module Series.

While these modules addressed all the competencies identified in the National Center's original research, the passing of time gave rise to new areas of need. Hence, since 1982-83, the Consortium has each year selected specific areas of need and undertaken the development of additional products to meet these needs. During 1985-86, the need to find ways of bringing about a closer integration of vocational and academic instruction was identified as an area of concern, which resulted in the development of this guide on academic/vocational-technical integration.

Many persons participated in the conceptualization of this guide. A technical advisory panel was convened to identify the issues and concerns that this guide should address. Members of this committee included Celeste Beck, Department Chairperson, Palm Beach Junior College, Florida; Mike Fitzpatrick, Assistant Superintendent, Pathfinder Vo-Tech High School, Palmer, Massachusetts; Barbara Hinton, Instructor of Vocational Education, University of Arkansas, Fayetteville; Clifford Migal, Associate Superintendent, Great Oaks Joint Vocational School District, Cincinnati, Ohio; and Ronald Stammel, Director, Dauphin County Area Vocational Technical School, Harrisburg, Pennsylvania.

Several persons contributed to the development of this guide. Catherine C. Fitch participated in the conceptualization of the guide and prepared the prospectus for it. Lois G. Harrington, Program Associate, assumed major responsibility for drafting the manuscript, revising the guide following field review, and preparing it for publication.

Recognition also goes to the following persons who provided helpful field reviews of the document: Rose Marie Baum, Barbara Hinton, Jack Nichols, and Wyonne Swafford.

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Robert E. Taylor
Executive Director
The National Center for Research
in Vocational Education

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INTRODUCTION

Schools must continually change to meet changing societal needs and priorities. At present, there is a good deal of discussion and publicity about students graduating from the nation's schools with inadequate basic skills. Correcting this situation has become a national priority, and a new educational reform movement--known as the Excellence Movement--has been initiated. As part of this Excellence Movement, many suggestions have been offered, and quite a few of them involve increasing academic requirements and decreasing "electives," including vocational-technical education. Solutions of this type raise great concern on the part of some educators, who feel that increased academic course work will not serve the needs, interests, and abilities of **all** the students the schools are intended to serve. Some students learn academic content best through the hands-on types of activities traditionally offered in vocational-technical classes. Some students are motivated to remain in school only through occupationally relevant course work.

This guide looks at both the dream of excellence and the reality of human capabilities--and tries to strike a balanced view somewhere in between. Then with a reasonable definition of excellence as a basis, the guide describes some ways in which the present educational system can better ensure that our graduates are (1) liberally educated, with a world view and historical view beyond the limited menu offered by television; (2) academically prepared, with the basic math, science, and communication skills needed to survive and thrive in today's society; and (3) well prepared for entry into the world of work as well, with the technical and employment skills required. Finally, the guide focuses on specific models of academic/vocational integration currently operating in America's schools, models that prove that when dreams are tempered by reality, real excellence--for the less capable learner, the gifted learner, and all those in between—is possible.

The guide is not designed to give you one definitive set of steps to follow in integrating academic and vocational education. The requirements of your particular state and the characteristics of your educational institution will determine the ultimate nature of your integrated approach. This guide does, however, try to provide the tools you need in order to plan an effective integrated program. Part II presents the factors that seem to make the difference between success and failure in implementing an integrated approach, and it describes the areas that need to be addressed and the questions that need to be asked and answered. In Part III, the descriptions of model programs include a great deal of detail about how the programs were set up and what barriers and facilitators to implementation were discovered. Using the information provided, you should be able to plan and implement an approach that best fits the needs of your particular situation and setting.

Another guide in the Competency-Based Vocational Education Administrator Module Series needs to be mentioned because it relates closely to the topic covered here. Improving the Basic Skills of Vocational-Technical Students: An Administrator's Guide can perhaps best be viewed as providing the groundwork for this guide. It deals with defining the "basic" skills and presents a number of staffing structures and program approaches for improving the basic skills of vocational-technical students. This present guide looks beyond that. At a time when some high-powered and highly visible individuals are questioning

whether vocational education should be a part of our secondary schools, this guide seeks to prove that some vocational education--occupational preparation--should be required for **all** students and, at the same time, that **all** students should be better prepared academically, **within their capabilities.** In short, this guide recommends the integration of academic and vocational education.

PART ONE

THE NEED FOR INTEGRATION

Chapter I

WHY EXCELLENCE NEEDS VOCATIONAL EDUCATION

The literature of the last ten years is full of the "liberal arts versus vocational education controversy." While many of the questions raised are valid ones, they are sometimes buried in larger philosophical questions about the purpose of education and the relative value of different educational tracks. Liberal education is defended against "anti-intellectualism" and the "new vocationalism." Vocational education is defended against "academic elitism." Within this attack/defend mode, it's easy to slip into either/or solutions--easy, but unfortunate.

The situation is not helped by the separation of academic and vocational education, in terms of both organization and funding, at all levels. There is good reason to suggest that making an integrated educational system a reality is and will remain an impossibility so long as representatives of the two camps so seldom communicate--not in Washington, D.C.; not in the various state departments; not in the local schools; and not in the universities and colleges responsible for teacher training.

What is meant by an integrated educational system? It means that the idea of a pure liberal arts curriculum as a preparation for life may have been viable for the landed gentry of earlier centuries and for those today who wish to remain in an academic or pure research environment, but it is not generally viable today. It means that a general education curriculum, preparing a person neither for further education or the world of work, may, in the view of many people, never have been a viable option. And it means that the idea of a pure technical skills curriculum as a preparation for life in today's postindustrial information/service society is equally absurd.

With few exceptions, all people need to think, compute, and communicate; and all people need to earn a living. To do so with success requires a more unified curriculum--one which allows each individual to focus on a particular area of strength and interest but which also requires each individual to acquire the full range of skills needed to function in the future. Liberal arts graduates need to be employable, and vocational-technical graduates need to be able to communicate and compute. In short, students need an integrated academic/vocational curriculum.

A Brief History of the Controversy

Given the track systems imbedded in our educational institutions--academic, general, occupational--it is not surprising that there is competition for student placement. Educational programs and instructional jobs depend on adequate numbers of enrollees.

In the 1980s, educational philosophers and commissions are calling for a return to basics. Some, such as Mortimer Adler in his Paideia Proposal, call

for a uniform academic course of study for all students and the virtual elimination of choice--and vocational education--from the curriculum. Most proposals are not so extreme.

The Nation at Risk, for example, does not call for the elimination of options or suggest that all students have the same needs and abilities. However, it does place a hierarchical order on the various programs. Schools must first and foremost provide the "Five New Basics" (four years of English; three years each of math, science, and social studies; and one half year of computer science). All other subjects, such as vocational education and the arts, must come second.

Vocational educators are, with justification, sensitive about coming "second." Some of the commissions, furthermore, lacked any vocational representation; the educators of 16 million Americans had no direct input. Finally, past history indicates that the "basics first; vocational education second" posture (like "eat your vegetables and you can have dessert") has been one reason for the failure of some of our youth to remain or succeed in our educational system.

Thus, although vocational educators support educational excellence, they have some valid concerns about how the route to excellence is currently being defined, and the debate continues. Sample 1 shows a partial listing of the excellence reports and rebuttals.

The debate is not new. The dilemma is not new. In 1971, Rupert Evans wrote--

> A cycle can be observed which is repeated approximately once every generation: (1) establishment of a reasonably comprehensive high school, (2) gradually decreased emphasis on vocational education, (3) establishment of separate vocational schools, and (4) the re-establishment of comprehensive high schools which emphasize vocational education . . . these cycles tend to coincide with the nation's needs for skilled manpower. . . .
>
> Perhaps the basic difficulty is in implementing the concept of the comprehensive school. Too often, a school which bears this name tries to meet the needs of all students simply by putting programs for all students under the same roof. What we need is a community high school and a real community (junior) college which is not content to have competing programs under the same roof, but ". . . fuses academic and vocational education as every-day partners."[1] One of the first ways to make vocational and general education every-day partners is to establish instructional programs which point out to students that instruction in every class is relevant to what they are now learning, and will be relevant in their lives ahead. Since we do

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1. Theodore Brameld, "Reaction," in Vocational Education: A Prospectus for Change, edited by Carl J. Schaefer and Jacob J. Kaufman (Boston, MA: Massachusetts Advisory Council on Education, 1967), p. 23.

SAMPLE 1

THE EXCELLENCE DEBATE

Action for Excellence: A Comprehensive Plan to Improve Our Nation's Schools. Denver, CO: Education Commission of the States, Task Force on Education for Economic Growth, 1983. ED 235 588

Adler, Mortimer J. **The Paideia Proposal:** An Educational Manifesto. New York, NY: Macmillan Publishing Co., 1982.

Ascher, Carol, and Flaxman, Erwin. **Towards Excellence:** An Urban Response to the Recommendations for School Reform. New York, NY: ERIC Clearinghouse on Urban Education, 1985. ED 256 838

Boyer, Ernest L. **High School:** A Report on Secondary Education in America. A Report of the Carnegie Foundation for the Advancement of Teaching. New York, NY: Harper & Row, 1983. ED 242 227

Bunzel, John H., ed. **Challenge to American Schools:** The Case for Standards and Values. New York, NY: Oxford University Press, 1985.

Copperman, Paul. **The Literacy Hoax:** The Decline of Reading, Writing, and Learning in the Public Schools and What We Can Do about It. New York, NY: Morrow Quill Paperbacks, 1979.

Crain, R. L. **The Quality of American High School Graduates:** What Personnel Officers Say and Do about It. Report 354. Baltimore, MD: John Hopkins University, Center for the Social Organization of Schools, 1984. ED 244 069

Edson, C. H. **"Risking the Nation:** Historical Dimensions on Survival and Educational Reform." Issues in Education. 1 (1984): 171-184.

Educating Americans for the 21st Century: A Plan of Action for Improving Mathematics, Science and Technology Education for All American Elementary and Secondary Students So That Their Achievement Is the Best in the World by 1995. A Report to the American People and the National Science Board. Washington, DC: National Science Foundation; The National Science Board Commission on Precollege Education in Mathematics, Science, and Technology, 1983. ED 233 913

Feldman, Marvin. **"In the Name of Excellence:** The Ambush of American Education." Paper presented at the American Vocational Association Convention, New Orleans, December 1984. ED 252 724.

Goodlad, John I. **A Place Called School:** Prospects for the Future. New York, NY: McGraw-Hill, 1984. ED 236 137

Hughes, Ruth. **Secondary Vocational Education:** Imperative for Excellence. IN 277. Columbus, OH: The National Center for Research in Vocational Education, The Ohio State University, 1984.

Investing in Our Children: Business and the Public Schools. New York, NY: Committee for Economic Development, 1985. ED 261 117

Involvement in Learning: Realizing the Potential of American Higher Education. Final Report of the Study Group on the Conditions of Excellence in American Higher Education. Washington, DC: U.S. Government Printing Office, 1984. ED 246 833

Keeping Vocational Education at Work: A Report of the Blue Ribbon Committee on Secondary Vocational Education in Ohio. Columbus, OH: Ohio Department of Education, Division of Vocational and Career Education, 1984.

Koltai, Leslie. **Redefining the Associate Degree.** Washington, DC: American Association of Community and Junior Colleges, 1984.

McDill, Edward L.; Natriello, Gary; and Pallas, Aaron M. **"A Population at Risk:** Potential Consequences of Tougher School Standards for Student Dropouts." American Journal of Education. 94 (February 1986): 135-181.

A Nation at Work: Education and the Private Sector. A Report of the National Advisory Council on Vocational Education and the National Alliance of Business. Washington, DC: National Alliance of Business, 1984. ED 246 201

National Academy of Science, National Academy of Engineering, and Institute of Medicine. **High Schools and the Changing Workplace**--The Employers' View. Report of the Panel on Secondary School Education for the Changing Workplace. Washington, DC: National Academy Press, 1984. ED 244 081

National Commission on Excellence in Education (David P. Gardner et al.) **A Nation at Risk:** The Imperative for Educational Reform. An Open Letter to the American People. A Report to the Nation and the Secretary of Education. Washington, DC: U.S. Government Printing Office, 1983. ED 226 006

National Commission on Secondary Vocational Education. **The Unfinished Agenda:** The Role of Vocational Education in the High School. IN 289. Columbus, OH: The National Center for Research in Vocational Education, The Ohio State University, [1984]. ED 251 622

Peterson, Paul E. **Making the Grade:** Report of the Twentieth Century Fund Task Force on Federal Elementary and Secondary Education Policy. New York, NY: Twentieth Century Fund, 1983. ED 233 112

Sizer, Theodore R. **Horace's Compromise:** The Dilemma of the American High School. Boston, MA: Houghton Mifflin Co., 1984.

Swanson, Gordon I. **Excellence in Vocational Education:** A Policy Perspective. IN 280. Columbus, OH: The National Center for Research in Vocational Education, The Ohio State University, 1984.

Woodring, Paul. **The Persistent Problems of Education.** Bloomington, IN: Phi Delta Kappa Educational Foundation, 1983. ED 245 366

not want to tell students an untruth, we need to make sure that all education really is relevant.[2]

The last "crisis" was in 1957, when the Russians launched Sputnik. For America to be behind in the space race was unthinkable. Clearly, the country was not producing individuals with the skills needed. So Americans turned to the schools, with ample dollars, to produce the needed mathematicians, physicists, and biologists.

During the 1960s, social upheaval, as well as equity issues supported by President Johnson's Great Society program, had an enormous effect on educational rigor. In reaction to what was deemed repressive and intellectually unchallenging about the existing educational system, students and educators forced new options: pass/fail grading, increased course offerings outside the "basics," increased student involvement, a focus on "relevance." Concern for equity brought both new students and new subjects, such as Black Literature, into the curriculum.

At present, America is facing another Sputnik-type crisis--this time in terms of the economy. Economists speak of double-digit inflation, stagflation, unemployment, and a declining productivity rate. And Japan, with a stable productivity rate, is beating America in the high-tech and automotive industries. Clearly, the previous "indulgent" age had not produced the individuals needed to ensure America's ability to compete. So, once again Americans turn to the schools for solutions.

Increased academic rigor is again the order of the day. Excellence studies call for educational programs--for **all** students--that are more like those of the successful Japanese. A more classical curriculum is called for. Longer school days, school weeks, or school years are advocated. Higher student achievement standards are demanded. These solutions have one very critical weakness: they sometimes have little connection with reality.

A Brief Glance at Reality

Let's look at some of the charges made and strategies put forth as part of the Excellence Movement and consider them in light of reality.

Our schools should have the rigor of Japanese schools; they're successful. Japanese students take a rigorous government-specified curriculum and attend school 240 days a year, including Saturdays. They are also operating from a totally different social and political philosophy from ours.

One need only look at Russian-American sports competitions, as an example, to see the difference between authoritarian and democratic systems. At each event, some attention is always paid to the unfair advantage held by Russian athletes, who are identified in their youth and groomed through intensive, rigorous, government-designed and government-supported athletic programs.

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2. Rupert N. Evans, Foundations of Vocational Education (Columbus, OH: Charles E. Merrill Publishing Company, 1971), p. 58.

As Americans, we do not laud the **system** that produced such outstanding results--though we do admire the results. We, of course, wouldn't turn down any government subsidies for our athletes--so long as there were no strings attached. But we would not welcome or allow the government to select, to design, to impose. Freedom of choice is an American essential.

That Japan can, as a country, impose a rigorous lock-step curriculum on its young may produce desirable results, but it is not an American solution. Furthermore, studies show that Japan's educational success in some areas is offset by a lack of individual creativity and a fairly high youth suicide rate.

We are becoming a nation of illiterates. Illiteracy in the United States is a problem. The usual figures cited in the news media are that one in five American adults are considered functionally illiterate. Jonathan Kozol, in his book Illiterate America, estimates that 27 million Americans cannot read. Jim Cates, of the Adult Performance Level (APL) Project at the University of Texas, estimates that varying degrees of illiteracy beset more than 70 million Americans. Yet, according to Paul Woodring, "the evidence is that illiteracy has declined steadily for the past two centuries."[3]

What is true is that illiteracy is a problem for some groups in our society. So while we are not becoming a nation of illiterates, we do need to be concerned about those among us who are handicapped by illiteracy from full participation in American life. One probable cause of this illiteracy is the fact that members of minority groups--Hispanics and blacks--have high dropout rates, with Hispanics having the highest rate. It is estimated that 45 percent of Hispanic youth never graduate from high school. It is also estimated that minority students will be in the majority in schools of the future; perhaps 30 percent of our students will be minorities by 1990.

Falling SAT scores prior to 1983 proved undeniably that our youth were getting a second-rate education. Actually, one reason given for declining scores is that more students of all abilities are taking the test. As a result of a move toward universal higher education and open enrollments in the U.S., a wider range of students have been taking SATs.

Furthermore, the SAT is not an **achievement** test. SAT stands for Scholastic Aptitude Test. It is a test designed to measure students' **aptitudes** for college, not their present command of subject matter. And although thinking skills are highly valued by the excellence reformers, it is unlikely that the SAT, a timed multiple-choice test, provides much opportunity for students to exhibit higher-order thinking skills.

Paul Woodring[4] points out that to claim that declining SAT scores signal a national crisis is unjustifiable for another reason. Only one-third of the high school students in the U.S. take the SAT, and they do so voluntarily. The

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3. Paul Woodring, The Persistent Problems of Education (Bloomington, IN: Phi Delta Kappa Educational Foundation, 1983), p. 106.

4. Woodring, The Persistent Problems of Education, pp. 103-105.

number of students per state who take it varies enormously: in New York, 50-69 percent take the SAT; in South Dakota, 2 percent; in Washington, they take a different test. To say, then, that trends in SAT scores represent national trends is patently inaccurate. To say they are representative of all students neglects the fact that they include a skewed sample: only the college-bound.

Woodring also notes that SAT scores declined after 1970 and rose after 1980—three years **before** the 1983 Nation at Risk report--and no one can really explain why.

Employers want to hire graduates who have a strong foundation of basic skills, whom they can train in specific technical skills on the job. Statistics supporting and refuting this claim are available. Proponents of a pure back-to-basics movement and proponents of occupational education can each find statistical support for their views.

The Council for Basic Education (CBE), for example, celebrated the Committee for Economic Development policy statement on public education, Investing in Our Children, because of its--

> clear and compelling evidence that the requirements for successful entry-level employment . . . are not at all job-specific or technical skills but are basic communication skills, interpersonal skills, higher level thinking skills such as problem-solving and decision making, and a set of attitudes which reflect a willingness to work hard and follow through on a job.5

This "clear and compelling evidence" has led many to base their educational proposals for a **single** common-core **academic** curriculum for all students on the premise that business and industry are asking for students with strong basic skills and the ability to learn and think, whom they can train technically on the job. But there is equally clear and compelling evidence that such is not the case.

For example, according to Sue Berryman, a Rand Corporation consultant and author of the report "The Adjustments of Youth and Educational Institutions to Technologically-Generated Changes in Skill Requirements," employer expectations have been misinterpreted.

> Berryman criticized the notion, espoused by Education Secretary William Bennett and others, that employers seek only students with math and English fundamentals who can be trained on the job.
>
> "Employers have downgraded their expectations" from the nation's schools, she said. According to Berryman, employers want students with vocational skills as well as the basics of math and English.6

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5. Marsha Levine, "Employability and the Core Curriculum," Basic Education, 30 (November 1985): 9.

6. "Magnet Schools Represent 'Serious' Attempt at Voc Ed Reform," Vocational Training News, 16 (July 25, 1985): 2.

Likewise, in an employer survey conducted at Pensacola Junior College, employers said they wanted graduates to possess direct job skills (e.g., welding) because these skills equipped individuals to **begin** a job. And they also wanted other, related skills (e.g., safety-mindedness, human relations, communications) because these skills equipped new workers to **keep** the job.[7]

Vocational education does not prepare students to succeed in the world and should be eliminated from the curriculum. Although most of the attacks in this regard have been directed at the secondary level, the postsecondary level is not immune. There are those who loudly and fervently wish that community colleges would return to their "true" transfer function, providing individuals with a liberal or general education instead of a "terminal" degree in a "narrow" occupational specialty. In this regard, a new excellence commission has addressed how we can "realize the potential of higher education."

In fact, the evidence of a number of recent studies or reviews of studies, although tentative, would seem to indicate that (1) students in general education and vocational education programs at the secondary level **appear** to attain similar basic skill levels, and (2) taking vocational courses is strongly associated with success in the labor market immediately after high school. (See sample 2 for a list of these reports.)

Recent national studies by the National Center show that, in comparison with nonvocational high school graduates, vocational education's graduates get jobs more quickly, earn better pay, have fewer weeks of unemployment, show greater immediate and long-term productivity, and require less on-the-job training. Further, white female vocational graduates enjoy a $19 per week wage advantage, while minority female vocational graduates earn $40 more per week than their counterparts who have not had vocational education. Finally, although data are inconclusive, there are indications that vocational graduates who are handicapped get jobs more quickly than their counterparts who did not take vocational education.

Earlier, reference was made to the focus on declining SAT scores that characterizes the excellence crisis. Given that the SAT test is part of the college admissions process, this focus suggests the reformers' bias. Though the proposals are worded in terms of **all** students, the concern is in fact with the college-bound. However, two out of three high school graduates in the U.S. do not go to college--nor, given individual abilities and goals and predicted labor market needs, is there any reason they should.

What is to become of those two-thirds of our youth? To succeed in America, one works; to partake of the "American Dream" costs money. To work requires job skills--skills that vocational education provides. How broadly those job skills are defined is another question, one we shall deal with later, but one fact seems clear: To treat an educational institution solely as a prep school for a higher level of education ignores the reality for two-thirds of our youth.

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7. Noojin Walker, "Institutional Change through Defining Program Competencies," paper presented to the Florida Association of Community Colleges, Orlando, 1980, p. 6. ED 198 879

SAMPLE 2

RESEARCH STUDIES

Asche, F. Marion, and Vogler, Daniel E. "Employer Satisfaction with Secondary Vocational Education Graduates." The Journal of Vocational Education Research. 5 (Fall 1980): 53-61.

Corman, Louise. Basic Skills Proficiencies of Secondary Vocational Education Students. Vocational Education Study Publication No. 4. Washington, DC: U.S. Department of Education, 1980. ED 197 086

Desy, Jeanne; Campbell, Paul B.; and Gardner, John A. High School Vocational Education Experiences: In School and in the Labor Market. RD 244. Columbus, OH: The National Center for Research in Vocational Education, The Ohio State University, 1984.

Desy, Jeanne; Mertens, Donna M.; and Gardner, John A. The Long-Term Effects of Vocational Education: Earnings, Employment, Education, and Aspirations. RD 246. Columbus, OH: The National Center for Research in Vocational Education, The Ohio State University, 1984.

Haney, Walt, and Woods, Elinor M. Secondary Vocational Education, Basic Skills, and Employment. Revised. Cambridge, MA: Huron Institute, 1982. ED 220 617

Kang, Suk, and Bishop, John H. The Effect of Curriculum on Labor Market Success Immediately after High School. Research Brief No. 6. Columbus, OH: The National Center for Research in Vocational Education, The Ohio State University, 1985. ED 262 256

Lotto, Linda S. Building Basic Skills: Results from Vocational Education. RD 237. Columbus, OH: The National Center for Research in Vocational Education, The Ohio State University, 1983. ED 232 015

Mertens, D. M. et al. The Effects of Participating in Vocational Education: Summary of Studies Reported Since 1968. RD 202. Columbus, OH: The National Center for Research in Vocational Education, The Ohio State University, 1980. ED 199 435

Navaratnam, K. N., and Hillison, John H. "Determining Economic Outcomes of Vocational Education." The Journal of Vocational Education Research. 10 (Fall 1985): 1-12.

Vetter, Louise et al. Vocational Education Teacher Preparation to Improve Secondary Students' Basic Skills: An Exploratory Study. Final Report. Columbus, OH: The National Center for Research in Vocational Education, The Ohio State University, 1983. ED 228 398

Weber, James M. et al. A Quantitative Study of Basic Skills and Vocational Education. Final Report. Columbus, OH: The National Center for Research in Vocational Education, The Ohio State University, 1982. ED 215 174

Young, Jerry L. "What Competencies Do Employees Really Need?--A Review of Three Studies." Journal of Career Development. 12 (March 1986): 240-249.

The argument that liberally educated youth with the ability to think and learn can succeed in any job is also valid only in theory. Statistics show that 80 percent of the employment opportunities in the future will be with firms of fewer than 100 employees. Such firms typically hire individuals who already have entry-level skills; they offer no provisions for extensive on-the-job training. Given competition for available jobs, this is understandable. If, in reality, approximately two out of three students will seek employment directly from high school, do we not have an obligation to prepare them for that reality?

Another underlying flaw in the argument for enforcing strict academics for everyone is that it assumes that everyone has the innate ability and the necessary **desire** to succeed in such a program. The high dropout rates the nation has been battling for decades are testimony to the fact that this is not the case. The commissions are proposing solutions that seem designed to fit the reality of the 1900s, when only 6 percent of our citizenry--the intellectual elite--entered (6.7%) and graduated from (6.2%) high school, destined for lives of leadership or contemplation. In the 1980s, 99 percent of our youth enter high school and 70-80 percent graduate, and these are individuals with widely varying needs, interests, abilities, and career goals.

The reality is that the great majority of the jobs in the future (some say 70%) will be vocational in nature. Robotics will absorb many of the unskilled positions, and managerial and administrative positions will decrease. The bulk of the jobs, it is predicted, will be in sales, service, and clerical fields, at the technical and professional levels. It is no accident that there are federal cuts in grants for higher education. It is no accident that young people, increasingly, are selecting occupational preparation in secondary and two-year postsecondary institutions. Although it is a valuable educational experience, a four-year college education is an increasingly costly experience, which--in terms of the labor market opportunities--is not a cost-effective experience f**or all** people.

The reality is that those who claim that vocational education does not prepare students for life--that it is narrow job-specific training--have clearly never visited the countless excellent vocational programs in the U.S. or read a single issue of the American Vocational Association journal. Good vocational programs--and there are many--do not just teach technical skills. Math skills, communication skills, interpersonal skills, work ethics, and employability skills are part of each program.

Remember, for most vocational programs, students' placement in the jobs for which they were trained is one key measure of program success, which has funding implications. With the assistance of occupational advisory committees, good vocational programs have always sought to prepare students both to meet the needs of area employers and to meet the needs of the students themselves. This means that they have not just prepared a welder, for example, but an **individual**. Vocational programs are not designed purely in response to labor market supply and demand; they are designed for the education of a whole person.

One has only to look at vocational student organizations (VSOs) to see the truth of this. VSOs are **not** extracurricular; they are an integral part of the vocational program. Through VSO activities, students experience public speaking, community service, parliamentary procedure, leadership, teamwork, preliminary participation in a profession, and so on. Such activities do not constitute narrow job-specific training.

What is needed are higher standards and a more rigorous educational curriculum. Much of what has already been said suggests that this notion must be tempered. It makes little sense to suggest that, since students can't meet the present standards, we should raise them. It makes little sense, given the strides we have made in making education more responsive to individuals and their learning styles, to suggest that **all** students should be required to take a set academic curriculum. And it makes little sense--given heterogeneous grouping and large-group, teacher-directed, time-based instruction--to suggest that all students **must** succeed in the academic track. Given such a system, many less capable learners **can't** succeed. Universal education cannot, by definition, be intellectually elitist in nature.

Critics of the present educational system should remember what that system is being asked to do--by its citizenry. For example:

- Give every student an opportunity to develop, to the maximum, his/her various abilities as an individual
- Provide for students' individual differences in methods of instruction and operation
- Teach the fundamental skills that will enable the individual to become a competent member of society--one capable of earning a living; taking care of a family; and understanding the duties, responsibilities, and privileges of being a citizen
- Develop within the student an intellectual curiosity
- Help foster in the learner a sense of moral and spiritual values
- Teach principles of sound mental and physical health
- Develop within each student an understanding and appreciation of the arts
- Provide an opportunity for growth and development of leisure-time activities
- Develop leadership skills
- Through efforts designed to meet the needs of students with educational or economic disadvantages or other special/exceptional needs, minimize class, social, and other distinctions contrary to equity
- Teach employability skills (i.e., how to get a job)
- Teach employment skills (i.e., how to maintain a job and how to progress on the job)
- Teach driver education . . . sex education . . . energy conservation education . . . drug abuse education

In the words of the managing editor of American School Board Journal, Jerome Cramer: "Schools are now asked to do what people used to ask God to do."[8]

Those opposed to a strict, single-curriculum, back-to-basics thrust are all vocational educators protecting their turf. The articles in sample 1, pp. 7-8, are evidence that protection of turf is not always the issue and that vocational educators are not alone in their concern. Increased dropouts are a concern, equity is a concern, and the economic implications of failing to provide occupational preparation are a concern. A **balanced** curriculum--with opportunities for all our youth to experience success and prepare for their preferred futures--is called for, not just by vocational educators, but by representatives of education in general (see sample 3).

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8. "Help! Teacher Can't Teach!" Time, 115 (June 16, 1980): 59.

SAMPLE 3

SUPPORT FOR A BALANCED CURRICULUM

Resolution 10. A Balanced Curriculum

A limited interpretation of the basics required in education threatens a balanced and high-quality curriculum for students living in our complex society. The curriculum should be broad enough to offer suitable educational opportunties for all students relative to their academic, social, psychological, and health needs and abilities. ASCD recognizes that further development and emphases are needed in teaching skills of problem solving, reasoning, conceptualization, and analysis, which are among the neglected basics needed in tomorrow's society.

In meeting the need for balance, the American educational system will provide all children with a general education, which will result in the development of social sensitivity, intellectual competence, healthy lifestyles, aesthetic responsiveness, and desirable ethical standards.

In addition, schools cannot neglect those areas of the curriculum encompassing the arts, the humanities, music, vocational offerings, and extracurricular programs designed to meet the developmental needs of students. ASCD recognizes that all individuals have different educational needs and abilities, thus requiring the provision of differential programs in the schools. Further, ASCD endorses school goals that include the mastery of language, a core of common learnings, community and civic service, and preparation for work and further study. Interdisciplinary studies can be an effective instructional means to provide curricular balance. Although ASCD recognizes that preparation for a career in science is appropriate for a number of students, special care should be taken to ensure development of science courses that help students understand the social problems and tradeoffs involved with certain technological advances.

An increasing number of states are requiring that more science credits be earned by secondary school students in order for them to be eligible for graduation or entrance to college. Plans for such changes in secondary school requirements should give prime consideration to a high-quality, balanced curriculum that offers students choices and flexibility regarding electives.

Therefore, ASCD encourages all personnel in schools and school districts to expand the concept of basics in education and to develop a high-quality and balanced curriculum in grades K-12 that will meet the educational needs of all students, and, further, urges its members to call attention to the need for a broad range of purposes in American education.

SOURCE: Resolutions 1986, Association for Supervision and Curriculum Development (ASCD).

NOTES

Chapter II

WHY VOCATIONAL EDUCATION NEEDS EXCELLENCE

The presence of the news media in our lives is one of those good-news/bad-news dilemmas. The news media have given much attention to the findings of the various commissions, which was desired. To create change in education, you first need to get the public's attention. Unfortunately, to grab an audience, the headlines often simplify the message, changing what may be balanced logic into prophesies of educational Armageddon.

Beneath the bombast and emotional debate, there is a vast area of universal agreement about the problem (though not perhaps about the solution). How we got to this point is not the issue. Who is to blame is not the concern. The point is that we must turn the situation around.

Academic programs must prepare their students better. College professors, in general, agree that the basic skills of too many entering freshmen are embarrassingly low. And in the view of one college English professor, what is most frightening--and harmful to the teaching/learning process--is that students seem to have no world view, no historical perspective, no grasp of the mythical symbols and classical allusions that pervade our literature, no mental muscle. Nor, in the view of employers, do academically prepared students have needed employment and employability skills. Vocational educators can help in this last regard.

General education programs, should that track continue to be an option, must ensure that their students are in fact **prepared** for something, whether occupation or further education. Students cannot succeed in life on a diet of **only** "soft" courses.

And vocational-technical programs must ensure that students, despite their preferences, are not allowed to skip the basics. Students need more than job training to live full, satisfied, productive lives. They need more than job training to meet employers' needs. Academic educators can help in this regard.

Fortunately, there is abundant evidence that when basic skills are linked with and applied to technical skills, students are willing and able to master them. For students who see little use for "book-learning"--who prefer concrete, hands-on, real-world activities--vocational education can be the vehicle whereby basic skills can be learned.

What, then, are the skills that vocational education should be providing? What do students need? What do employers want? There seems to be general agreement that the following skills are necessary:

- **Entry-level job skills**--More than entry-level skills are not, in most cases, required or even desirable. There is not **time** to teach more than that. Employers don't want more than that. And since skills become obsolete so quickly today, it is counterproductive to teach more than

that. Retraining, perhaps five to seven times, will characterize careers of the future--lifelong learning.

- **Common-core basic skills**--Math, science, and communication (reading, writing, listening, speaking) skills need to be included through instruction, remediation, reinforcement, and application. Computer literacy is another common-core skill that is becoming basic.
- **Job-specific basic skills**--Students training for certain occupations may require additional academic course work. For example, students in electronics or health occupations may need to take specific science courses.
- **Employability skills**--The skills needed to get a job include interviewing, conducting a job search, developing a resume, and completing a job application form.
- **Employment skills**--The skills needed to keep a job and advance in the occupation (or move laterally if needed) include interpersonal skills, educability skills, thinking skills, problem solving, decision making, ability to cope with change, risk taking, innovativeness, entrepreneurship, and leadership. Also included are the many affective elements desired by employers: punctuality, reliability, safety-mindedness, perseverance, cooperation, loyalty, enthusiasm, and confidence.

Although vocational instructors will recognize most of these skills as being a part of their present programs, the message from employers and others is clear: More is needed! Our present programs have not been judged to be inferior--and specific programs are acknowledged to be superior--but **overall**, they've been judged to be ho-hum, so-so, mediocre. That should be a challenge to us. Vocational educators have always sought excellence; by linking more closely with their academic colleagues, by pooling respective strengths, the quality of education for all students may be greatly enhanced--even to the point of excellence.

PART TWO
INTEGRATION STRATEGIES

Chapter III

PLANNING FOR INTEGRATION: STRATEGIES FOR SUCCESS

You can conceptualize the most brilliant and effective integrated approach possible, but if students, teachers, community members, and other decision makers don't buy the approach, your chances of success will be minimal. According to many educators, certain strategies, such as the following, can help to ensure that whatever integration plan you ultimately develop will have the best possible chance to succeed:

- Be enthusiastic and focus on the positive.
- Remember that change is a process, affecting many people.
- Back up your enthusiasm with needed support.

Enthusiasm

The recent focus on education's mediocrity has left many educators shell shocked. The news media's penchant for headlining only the dramatic, overstated, **bad** news has left us all with a tendency to see the glass as half empty. A recent survey of area vocational school directors revealed that only 3 percent are unconcerned about vocational education's image problem.[9]

To counteract shell shock and negativism and capitalize on whatever positive energy exists, you as a vocational administrator must see the glass as at least half full. You must feel and exhibit the same enthusiasm that you expect to develop in those who will be involved in the change. Your energies must be spent, not on defending what you've done in the past against media onslaughts, but on accepting the **challenge** offered--the **opportunity** to improve education and the image of vocational education.

Granted, philosophers and policy makers have an easier implementation job than do practitioners. The former can build their castles in the air; the latter must build them on the ground. Nonetheless, both groups have a legitimate function. Practitioners can become so enmeshed in the mundane problems of daily survival, which may seem to threaten to overwhelm them, that they lose sight of the stars. Having both star gazers and pragmatists in the world can keep us more balanced--that is, if they listen to one another.

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9. Orville Nelson, "The 1984 Area Vo-Tech School," VocEd, 59 (September 1984): 32.

Listening can be hard! In a 1980 cover story in Time entitled "Help! Teacher Can't Teach," a few quotes are used to begin the article and set its tone. One of the quotes is as follows:

> Speaking of educational reform, Richard H. Hersh, associate dean for teacher education at the University of Oregon, tells a meeting: "We've been rearranging deck chairs on the Titanic."[10]

Gloom and doom. Gloom and doom. The article is full of "hard data" and quotes from experts and practitioners, all leading to the support of the articles' thesis--that many teachers (through lack of ability or opportunity) can't teach; that perhaps 20 percent of them lack basic skills in reading, writing, and math; and that there is a crisis in our schools.

Although such well-publicized crises may secure the public attention and support needed to create change, excessive focus on the negative can be a major barrier to that change. The morale of those who must spearhead the change effort can be seriously damaged. And in order to prove the severity of the problems, so much evidence of failure is presented that the problems can appear insurmountable.

In fact, successful change efforts start from a positive "can do" posture. Someone, somewhere, with some power and influence needs to believe that change is not only good, but possible. At a time when federally appointed commissions and the news media serve up only critical reports, it is crucial that educational leaders, whether at the state or local level, reinforce all that is good in education and all that can be built upon to make it even better. Sample 4 provides an excerpt from a state department article that does just that.

Change

Too often, those responsible for change treat it as an event. It is, in fact, a process, and years of study have shown that people move through the change process in fairly predictable stages. At each of these stages, they have a different set of concerns about the innovation (new product or process), and these concerns must be anticipated and adequately addressed if the innovation is to be accepted and wholeheartedly embraced.

The exact number of stages and the names by which they are identified vary from author to author, but the differences between and among authors are not contradictory; rather, the work of one builds on the work of those who went before. The following stages and related concerns are typical:

- **Awareness**--Little concern about or involvement with the innovation is indicated.
- **Informational**--A general awareness of the innovation and interest in learning more detail about it is indicated. The person seems to be unworried about him/herself in relation to the innovation. She/he is interested in substantive aspects of the innovation in a selfless

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10. "Help! Teacher Can't Teach," Time, 115 (June 16, 1980): 54.

SAMPLE 4

"CAN DO" ARTICLE

The legislative provisions in the Perkins Act that encourage the strengthening of academic foundations of vocational education programs are welcomed and applauded. The liberal interpretation of these provisions--to encourage courses and instructional strategies for teaching principles of math and science via practical application--provides a necessary staple to the vocational education diet. The more broad, global interpretation of the legislative intent--to consider academic and vocational course work as a fused, coordinated curriculum for all students--is tempting food for thought.

The 31 words of Title II, Section 251, a(11) of the Perkins Act provide the major impetus to strengthen academic foundations of vocational education. This legislative provision indicates that states may use funds for--

> the conduct of special courses and teaching strategies designed to teach the fundamental principles of mathematics and science through practical applications which are an integral part of the student's occupational program

Though some may look upon the "may" component of the legislation as weak, this legislative statement is highly significant. Efforts to strengthen academic foundations, not highlighted in previous vocational education law, signal a recognition of the importance of underlying academic principles applied to vocational education. This signal has the potential of being highly influential to state legislators and state and local policymakers.

Further, the legislative provision gives credence to the long-held belief of many educators that the mutually exclusive approach to curriculum is no longer applicable. Business and industry, the compass for direction in vocational education, has supported this notion for some time. At a local level, employers have repeatedly voiced the need for academic skills as foundational to vocational skills. In High School and the Changing Workplace: The Employer's View, business/industry leaders recommended core competencies vital for almost every job. The competencies, transferable in nature and essential for adaptability, include a significant emphasis on academics.

It must be pointed out, however, that business and industry representatives did not request more academics per se, but **applied** academics. Such requests have frequently been misinterpreted, as expressed by Janet Hunt, Standard Oil of California, in A Nation at Work: Education and the Private Sector:

> A good example of misreading industry feedback to educational needs is the back-to-basics backlash. Industry people have been strongly advocating better business-English skills training and . . . this has been interpreted by some legislators/educators as four years of English literature.

Composers of legislation should be commended for providing language that stresses application of academics that are an integral part of the student's vocational program. They did not request **more** academics--a quantitative crevice out of which many critical education reviewers have not yet climbed.

Purpose, Priorities, and Potential

Application of this legislative provision has exciting potential. It provides a "WE CAN" approach not only to vocational education curricula but also to education curricula as a whole. With the general intent of the legislative provision--

WE CAN assist students with lifelong learning skills. Clearly, academics are fundamental to occupational programs, but they are significant factors, as well, in learning how to learn. This learning-how-to-learn is paramount to the retraining and reorienting of individuals encountering new jobs, which occurs five to seven times in the average person's work life.

WE CAN motivate students to learn both the vocational and academic skills. In The Unfinished Agenda, the National Commission on Secondary Vocational Education noted that vocational education is frequently "the catalyst that reawakens" student interest in school and "sparks a renewed interest in academics." This reawakening and sparking of interest has been evident in vocational programs in Ohio that have stressed applied academics.

WE CAN broaden opportunities for academic students. Students in the college preparatory track who have the opportunity to see the theories of math, science, or communication put to practice have a scope that is widened in terms of realism. The meaning of the subject matter is expanded.

WE CAN broaden opportunities for vocational students. Students in vocational programs have the opportunity to see that the practices and activities within their respective skill areas are based on sound principles and theory that carry over to other program areas.

WE CAN alter the perception of the public toward certain disciplines. Schools in which the vocational programs encompass principles of mathematics, physics, chemistry, and advanced communication will foster a more positive image of both vocational and academic programs.

WE CAN be pace-setters in the educational arena. Critics have urged that education needs to be more applied, more concrete, more related to the real world. A basic and accepted principle of teaching and learning relates relevancy and application to increased comprehension. Despite this, many academic classes function with little or no application. Vocational education, on the other hand, has by its very nature a history of applied learning. The marriage of vocational and academic content can provide the vocational education community opportunities for leadership in instructional design.

WE CAN help vocational students accelerate the pace and depth of understanding of their skill development. When students comprehend the principles upon which the application of knowledge is based, they will be better equipped to see application and relevancy of newly evolving knowledge. This will allow a greater level of efficiency and effectiveness in the classroom and on the job.

SOURCE: Darrell L. Parks and Gail H. Henderson, "Strengthening the Academic Foundations of Vocational Education Programs: A New Charter--A New Look" (Columbus, OH: Ohio Department of Education, Division of Vocational and Career Education, n.d.), pp. 1-4.

manner, such as general characteristics, effects, and requirements for use.

- **Personal**--Individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role with the innovation. This includes analysis of his/her role in relation to the reward structure of the organization, decision making, and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected.
- **Management**--Attention is focused on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are utmost.
- **Consequence**--Attention focuses on impact of the innovation on students in his/her immediate sphere of influence. The focus is on relevance of the innovation for students, evaluation of student outcomes, including performance and competencies, and changes needed to increase student outcomes.
- **Collaboration**--The focus is on coordination and cooperation with others regarding use of the innovation.
- **Refocusing**--The focus is on exploration of more universal benefits from the innovation, including the possibility of major change or replacement with a more powerful alternative. Individual has definite ideas about alternatives to the proposed or existing form of the innovation.[11]

Even with this brief introduction to one dimension of the change process, it should be evident to you that the process has enormous implications for your job as an agent of change. By identifying **who** will be interested in or affected by the change, taking steps to ensure they are kept aware and involved at appropriate levels, and targeting your awareness/involvement strategies according to each individual's or group's stage of concern, your chance of success is much more likely. (See sample 5 for sources of more information about the change process.)

Bear in mind, too, that these are not brief stages. You cannot, for example, meet with teachers seven times, for an hour or two each, to move them through each of the seven stages of concern. Change takes time. Nor can you write off a stage once participants have moved past it. Consider awareness, for example. The individuals involved in implementing the innovation (or supporting its implementation) change: some staff leave and new staff are hired; the advisory committee or school board membership changes. The nature of the innovation changes and evolves. Thus, creating awareness is a continuing need.

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11. G. E. Hall, R. C. Wallace, Jr., and W. A. Dossett, "A Developmental Conceptualization of the Adoption Process Within Educational Institutions" (Austin, TX: The University of Texas, Research and Development Center for Teacher Education, 1973).

SAMPLE 5

CHANGE PROCESS LITERATURE

Dennis, Warren G.; Benne, K. D.; and Chin, R., eds. The Planning of Change. Third Edition. New York, NY: Holt, Rinehart and Winston, 1976.

Bhola, H. S. "The Configurational Theory of Innovation Diffusion." Columbus, OH: The Ohio State University, School of Education, 1965. ED 011 147

Hall, Gene E.; George, A. A., and Rutherford, W. L. "Measuring Stages of Concern about the Innovation: A Manual for the Use of the SoC Questionnaire." Austin, TX: University of Texas, Research and Development Center for Teacher Education, 1977. ED 147 342

Hall, Gene E.; Loucks, S. F.; Rutherford, W. L.; and Newlove, B. W. "Levels of Use of the Innovation: A Framework for Analyzing Innovation Adoption." The Journal of Teacher Education. 26 (Spring 1975): 52-56.

Hall, Gene E., and Rutherford, W. L. "Concerns of Teachers about Implementing Team Teaching." Educational Leadership. 34 (December 1976): 227-233.

Hall, Gene E.; Wallace, R. C.; and Dossett, W. A. "A Developmental Conceptualization of the Adoption Process within Educational Institutions." Austin, TX: University of Texas, Research and Development Center for Teacher Education, 1973. ED 095 126

Havelock, Ronald G. et al. Planning for Innovation Through Dissemination and Utilization of Knowledge. Ann Arbor, MI: University of Michigan, Institute for Social Research, 1969.

Kirkpatrick, Donald L. How to Manage Change Effectively: Approaches, Methods, and Case Examples. San Francisco, CA: Jossey-Bass, 1985.

Miles, Matthew B., ed. Innovations in Education. New York, NY: Columbia University, Teachers College, 1964.

Rogers, Everett M. Diffusion of Innovations. Third Edition. New York, NY: The Free Press, 1982.

Attention to the **change process** and **involvement** of all appropriate groups and individuals are two keys to change. A third is attention to **marketing.** Marketing is not just selling. Marketing means that from the moment the new idea is conceived, you need to consider not only its development, but also how to ensure that the developed idea will be adopted. The product must be packaged in an attractive, usable way. A **felt** need must be created in the consumers. And as much attention must be paid to gaining the acceptance of the potential users as to creating a worthwhile product.

Spinach and liver are iron-rich worthwhile products. That in itself has not convinced a large number of people to eat them. Worthwhile is not enough. Many worthwhile products must be marketed before a felt need is created. Attention to marketing sold even the hula hoop; attention to marketing can sell your innovation.

Support

No matter how **valuable** the innovation, no matter how **convinced** users are of its value, change will not occur--or not for long--without both intrinsic and extrinsic forms of support. As an administrator, provision of such support is very much your responsibility.

Too often, teachers feel that every new educational goal that comes down the pike gets added to the already-long list of things they need to do, without the time and support to do it. Too often, they feel that few are **aware** of all they are doing and fewer still **appreciate** what they do.

Consider, for example, the new trade and industrial (T & I) teacher who must prepare lessons and teach, often while simultaneously learning how to teach. This teacher is then asked to accommodate (and learn how to accommodate) students with special/exceptional needs. Next, the teacher is asked to implement (and learn how to implement) competency-based education (CBE) and to write (and learn how to write) CBE learning guides. In his or her spare time, there are vocational student organization duties to perform.

That this agenda gets met at all is testimony to the extraordinary dedication of so many vocational teachers. But the job gets done better and more effectively, with less excess stress to the teachers, when administrative support is forthcoming. Part of this support is tangible: information, training, money, time, support staff, and other needed resources. Part of this support is less tangible: expressions of appreciation. Many administrators who have successfully brought about change mention the important part played by such elements as newspaper articles featuring teachers' accomplishments. But they also mention the enormous value of a simple thank you!

As you read the integration steps in Chapters 4 and 5, do not forget these three essentials: enthusiasm, attention to the change process, and support. They underlie each step. Implementing a change cannot be accomplished through a simple, mechanistic completion of steps. A human element is involved, and the needs and concerns of individuals must be constantly addressed.

NOTES

Chapter IV

PLANNING FOR INTEGRATION: THE FIRST STEPS

State requirements, the organizational structure of your institution, your present status relative to the integration of basic skills--such factors as these will affect the steps you need to take and the particular activities you perform at each step. Thus, the steps discussed in this guide are not set in stone. They do, however, provide an idea of everything that must be accomplished and everyone who should be involved. Viewed in the context of your own situation, these steps should be easily adapted to provide you with an approach to integration that meets your needs.

Three steps, and the activities in those steps, will be discussed in Chapters 4 and 5:

- Lay a foundation for the change and the need for the change.
- Conceptualize the nature and parameters of the change.
- Prepare for the change.

In this chapter, let's look at the first two steps in more detail.

Foundation

To plan an effective program, you need to start with sound information about where you are and where you need to go. What state and local requirements will affect what you do? What does the community want you to do? What ongoing efforts already contribute to an integrated approach?

State and Local Requirements

What teachers can be asked to teach--what preparation they have to teach--will be affected by the state certification requirements, which vary widely from state to state. If, for example, teachers must take a course in the teaching of reading to be certified, regardless of their subject matter specialty, then asking all teachers to reinforce reading skills is reasonable. If, on the other hand, postsecondary teachers drawn straight from industry need not be certified, requiring attention to students' reading skills may be a more uncertain proposition.

Likewise, the time allocated to vocational education and the scheduling practices statewide or locally will very much determine what you can do--or what you need to get changed in order to carry out your plans. In some systems, for example, secondary students spend four years at an area vocational school and take all their course work--both occupational and academic--in that one facility. In other systems, students fulfill academic requirements for graduation for two years and then focus on occupational skills for two years.

In still other systems, students spend half a day on academics and half a day on occupational skills.

Probably most critical at the present time, the state's graduation requirements and the state and local vocational education philosophies will affect not only what you can do but what you must do. In response to concerns about the inadequate level of students' basic skills, most states in the past decade have reviewed graduation requirements and their educational philosophies and placed additional stress on the need for all graduates to be at least minimally competent. In some states, minimum competence may be part of a mission statement; in others, it has the force of a mandate.

Thus, you need to secure and review all documents specifying state and local philosophies, missions, objectives, and requirements. Since so much of the current demand for minimum standards emanates from the national level, you should also ensure that you have read the key national reports concerning educational excellence (see sample 1, pp. 7-8).

Community Concerns

Many of the institutions and districts that have implemented programs designed to integrate academics into the vocational program started their efforts with a survey. Some limited the survey to employers; others included educators, graduates, and other community members.

If, as seemed to be the case in the models included in Part 3 of this guide, the survey reveals a need for vocational graduates to have better basic skills, then you have a strong case for making change. If the survey shows strong consensus on what those basic skills are (e.g., computation and communication), then you have a strong case for making particular changes.

The way in which you analyze the data can also help your change effort. In Arkansas, for example, they surveyed administrators, vocational teachers, academic teachers, advisory committee members, and graduates. They analyzed the data by respondent groups, geographic areas, and program types. By so doing, they assured themselves of great credibility in their findings and recommendations. They could prove, with hard data, that each group, in each region, regardless of program type, supported the need for improved basic skills. This proved to be a strong marketing tool.

If, on the other hand, your survey indicates that no improvement is needed or there is little consensus on the extent or nature of the need, then you have a different problem. Maybe your school is doing an exemplary job already--or maybe you are going to have to do a lot of work to convince certain key groups that there is a problem that needs to be solved. Perhaps you are going to have to spend some time involving key individuals and groups in reaching consensus.

Ongoing Efforts

State/local requirements and community concerns will let you know where you should be aiming. To know how far you need to go to meet those aims, you need to determine where you are now.

What **formal** efforts are being made to include academics within the vocational curriculum? How extensive are these efforts? What basic skills are involved? What **informal** efforts are being made; in other words, without an organizational commitment to integration, what basic skills are vocational teachers teaching as part of the normal vocational curriculum?

How well are vocational students scoring on achievement tests covering basic skills? How does this compare to local norms? state norms? national norms? Given the characteristics and demographics of the group, how do the scores compare to norms for similar groups? If students are below the norms, are they at least **above** the level of functional illiteracy?

Standardized test scores generally reflect achievement only in more easily measured areas, such as reading comprehension, vocabulary, grammar, and mathematics. Do you have any evidence of the levels of students' writing skills, listening skills, problem-solving skills? If not, can testing in these areas be arranged?

Conceptualization

Once you have gathered all your foundation data, you can put together a brief proposal (or concept paper) documenting the need for change. At this point, you should have a firm fix on the gap between where you are and where you need to be. You should also have enough hard data and expert opinion to validate your position.

The chore at this point is to have enough of an idea about what you want to do to close the gap that you can secure needed support from above to bring about change. On the other hand, detailed planning is not needed or even desirable. To plan in detail without permission to proceed can be a waste of time if that permission is not forthcoming. To plan in detail without the involvement of all interested parties can create resistance to the change before it's even past the idea stage. Thus, you have a fine line to walk at this point--planning in enough detail to convince decision makers that your plans have merit and potential, but not in so much detail that you will be presenting staff with no opportunity for input.

Your **written** concept paper--documenting the problem, the need, and the type of solution proposed--can then be shared with those whose support you need in order to proceed. Your role in the organization and state and local requirements will determine **who** you need to contact. If you are a local director or department head, you may need to start with a superintendent or college president, for example. The support of the board of education or trustees should be the next group whose support is sought. You may also need to secure approval from your state department of education.

Securing support can involve more than simply getting permission to proceed and high-level backing that you can use to gain acceptance of the effort with staff. It can also involve monetary support. Though state and federal funding levels for local programs have decreased over the years (state = 20%-50%; federal = 8%-12%), there is still money available at those levels for certain efforts. Given that monies for pilot programs are available and given that improvement of basic skills is a priority area, you should--with a

well-developed proposal--be able to secure some funding for a pilot program in this area.

The provisions of the Perkins Act include this kind of support. Title II, Part B says that funds for vocational education program improvement, innovation, and expansion may be used for--

> (8) programs relating to curriculum development in vocational education within the State, including the application of basic skills training. . . and (11) the conduct of special courses and teaching strategies designed to teach the fundamental principles of mathematics and science through practical applications which are an integral part of the student's occupational program.

Title III, Part B says that funds from consumer and homemaker education grants may be used for--

> (b) (2) support services and activities designed to ensure the quality and effectiveness of programs, including . . . application of academic skills (such as reading, writing, mathematics, and science) through consumer and homemaker education programs . . . .

State funding priorities will generally reflect similar concerns. In Ohio, for example, districts were **encouraged** to apply for state funds to support their development of different program options for the integration of academic and vocational education. Although pilot programs eventually must become locally supported programs, seed money allows the effort to get off the ground and supports initial costs, which are generally the highest costs.

Bear one caution in mind as you seek funds, however. Too often it is assumed that change cannot occur without huge amounts of additional funds. The availability of adequate monetary resources can certainly facilitate change in many cases, but be reasonable. As you approach the change, be careful to identify what you can do with **what you already have**, not just what you could do with more money.

Chapter V

PREPARING FOR CHANGE

With all necessary approvals (and, perhaps, funds) in hand, your next step is to prepare a more detailed proposal and prepare people for the proposed change.

Proposal Preparation

Before you can begin to prepare people for the change, you need a fairly good idea of the exact nature of the proposed change. Although **wide** input is ultimately desired, that input will be gathered more efficiently if people have a structured and fairly detailed proposal to react to. In other words, to ask a group of 200 teachers, "Here's the problem; what should we do?" will undoubtedly yield some interesting discussion, but it is unlikely--within a reasonable time frame--to produce a plan for change.

Thus, you should start with a small, but important, proposal development committee, which includes, for example, advisory committee/council members, administrators, supervisors, counselors, and teachers who are opinion leaders. With this group, you can plan in detail what you propose to do to further integrate vocational and academic education. In developing your proposal, you need to address a number of questions.

How are you going to define "basic" skills? We suggested earlier (see Chapter 2) that vocational students, to succeed on the job and in life, need entry-level job skills, common-core basic skills, job-specific basic skills, employability skills, and employment skills. The committee needs to clearly delineate what skills will be considered basic in your program. The foundation information you gathered should be carefully considered in making this decision.

Who will teach the academic skills? In some institutions and in some states, vocational educators are identifying the academic skills they already teach in their programs and are seeking--and being granted- approval to award academic credit toward graduation for academic skills learned through vocational instruction.

Proponents of this approach claim, with some validity, that a great deal of math or science or English is already taught in vocational classes because the academic skills are essential to successful performance of the occupational skills. Many electronics teachers provide science instruction. Many business teachers provide English instruction. Many carpentry teachers provide math instruction.

Other institutions and states feel that in order to assure high-quality academics worthy of graduation credits, certified academic teachers must provide the academic instruction, correlated with and reinforced by the occupational instruction. To do otherwise, they feel, makes a mockery of teacher

certification standards. In fact, there is evidence that, although vocational teachers possess the academic **skills** needed for occupational tasks, they do not always have the expertise to explain the **theory** underlying the skill. It is that very theory--or the lack of it--that is one of the concerns of those urging educational reform.

Another factor related to this question is whether you can find the needed academic teachers in some areas, such as math and science, where there are teacher shortages nationwide. Some possible solutions you could consider are (1) encouraging vocational teachers to earn dual certification, (2) recruiting part-time teachers and retirees, (3) picking up staff released from high schools experiencing declining enrollments, or (4) using two part-time teachers instead of one full-time teacher (which, incidentally, may make it easier to schedule coordination time).

Clearly, the position of your state relative to this issue will affect your answer to this question. You may have little choice. If the decision is yours, however, the committee will need to decide where academics will be taught and by whom.

Who will teach the vocational skills? In some cases, one vocational teacher teaches both shop and related instruction. In other cases, different teachers handle the two instructional tasks or use a team approach to teach both. Based on your present staffing structure and the demands of your proposed integration effort, the committee needs to determine how responsibility for teaching the vocational curriculum will be handled in the future.

How will other basic skills be integrated into the curriculum? Students and employers both are asking for improved employability and employment skills. Who will be responsible for teaching students the skills needed to get a job? The English teacher? The related instruction teacher? Both?

Who will teach employability skills? There is a perhaps unfortunate trend of late to identify needed skills, such as thinking skills, and to respond to those needs by developing a **separate unit** for teaching each skill. In fact, employability skills can best be taught--and learned--if they are an integral part of all instruction--so integral that thinking and problem solving and decision making become as natural to students as breathing.

This is at the heart of the whole integration thrust. For example, it is a truism that students who deal with grammar as a separate subject learn to treat it as one. They often don't transfer what they've mastered (e.g., when to use the objective case and when to use the subjective case with pronouns) to writing assignments and oral discussions even **within** English class. Even less frequently do they transfer their English skills to other classes--unless they are **required** to do so.

So it is with problem-solving skills and the like. If in all classes the problem-solving approach is used routinely to deal with problems--large and small, personal and educational--students will internalize use of that approach. Confronted with a problem, use of problem-solving skills will be automatic. If, however, they cover a problem-solving unit and never see that approach used outside that unit, they are far less likely to use that approach themselves. It's just a unit they got a grade on--and it's over.

Similarly, there is a great deal of evidence that such desirable employment characteristics as responsibility, reliability, punctuality, and so on, are best taught through the "invisible curriculum." In other words, you can tell students these characteristics are important, and they may, in return, don those characteristics and tell you they value them, because they know they need to in order to get a good grade. If, on the other hand, all **teachers** model the desired characteristics and the **program** requires and rewards these characteristics, the chances are better that students will in fact develop those characteristics. A teacher who does not collect or grade assignments or who gives "easy A's" is not teaching responsibility. Students who are not penalized for tardiness and absenteeism will not learn to value punctuality and reliability.

States and schools vary on how these areas can be treated. In some states, attendance and attitude elements **cannot** be part of student grades. In addition, the ultimate penalties available--suspension and expulsion--are often **rewards** to students who didn't want to be there anyway.

Thus, as the committee decides how and where employability and employment skills will be taught, they must develop a means of establishing a desirable invisible curriculum that adheres to state requirements and provides rewards and penalties meaningful to and valued by the students.

What level of integration will you seek? Not everything being called integration constitutes full integration. Full integration means that the total academic/vocational program is seamless. Academic and vocational teachers work as **equal** partners in an **articulated** effort to meet students' educational needs. Their interaction and mutual support are an integral part of daily instruction. In academic courses, students learn theory--deriving in large part from the vocational curriculum--from teachers who can use examples drawn from the occupation. In vocational classes, students apply that theory and reinforce their academic skills.

If, for whatever reason, you do not or cannot at this time seek full integration, there are other, less radical changes you can implement. At a bare minimum, there should be **cooperation** and an effort to **correlate** the two curricula. The academic skills taught should be those required for occupational entry and future educability (i.e., lifelong learning). The vocational curriculum should include the application and reinforcement of those skills insofar as possible.

Beyond that, you could choose from a number of staffing options, from simple cooperation to full integration. Academic and vocational teachers could plan cooperatively, but teach separately. Another common cooperative strategy is to share responsibility for designing and grading assignments. The occupational specialist--the vocational teacher--could suggest the topic for a student writing assignment and grade the completed report in terms of its technical content. The writing specialist--the English teacher--could assign the format the report should follow and grade the completed report in terms of the criteria for good writing.

In addition, academic and vocational teachers could team teach, regularly or periodically. Academic teachers could offer workshops to help vocational teachers improve their own basic skills. Vocational teachers could offer minicourses covering occupational skills to help academic teachers relate their instruction to occupational reality. Teachers could sit in on--audit--each

other's classes--not for evaluation purposes, but to learn from each other. Vocational and academic teams could spend time--a day, a week--in the real world of work, where vocational teachers can be technically updated and academic teachers can be occupationally oriented. Academic teachers can share vocational student organization (VSO) responsibilities, attending activities and teaching VSO skills (e.g., the English teacher could teach public speaking and parliamentary procedure).

Given the nature of our intended audience for this guide and the wisdom of a one-step-at-a-time approach to change, we have been focusing on what you as a vocational administrator can do to integrate academics into vocational programs. Bear in mind that ideally, however, preparation for employability and employment would be integrated into programs pursued by students in the academic track as well. Sample 6 shows an example of one such effort.

Before you can plan any further, the committee needs to decide, given your situation, how extensive your integration effort will be. In making this decision, it may be helpful to remember that **cooperation** has to do with people; **integration** has to do with curriculum.

What effect will your organizational structure have on your ability to integrate subjects? Can the structure be modified or changed? Your institution may house both academic and vocational students and teachers, all under your leadership. If the teachers do not interact much, you may have a lot of work to do to change that situation, but it is within your direct power to do so. Since the teachers are all under the same roof, getting them together is not a physical problem (though it may constitute a scheduling problem).

Your institution may house only vocational students, but both academic and vocational teachers to provide a total program for those students. As in the previous situation, the actors involved in the change are at least all under the same roof.

Or your institution may house only occupational students and teachers, with academic students and teachers housed at home schools. The vocational students may complete their academic work prior to or concurrent with their vocational course work. Change is no less possible in this situation, but it does involve some additional concerns.

For example, when teachers are housed in separate facilities, **many** different, geographically distant locations may be involved, depending on the number of home schools and the size of the district. That makes interaction among teachers more of a challenge. It also means that you must have--or must develop--strong cooperative relationships with the home school administrators involved. Such positive relationships should be a given, but in reality they are not as common as they should be, perhaps due to competition for students in the face of declining enrollments.

Given your structure and the level of integration sought, the committee needs to make decisions about whether the structure will remain the same or will change to facilitate greater integration. For example, vocational and academic teachers could be teamed to promote sharing. Or a math, science, and English teacher could be placed in each vocational program, clustered with and working with the vocational teachers in that program.

SAMPLE 6

LIBERAL ARTS/CO-OP PROGRAM

Resulting from a recent federal grant, jobs and internships relating to a student's major are now available to Pima College students enrolled in the liberal arts program.

Cooperative education has traditionally been limited to vocational areas such as welding, air conditioning, automotive mechanics, and nursing. The new program extends employment opportunities to students enrolled in other areas as well. Cooperative education's function is to provide an interrelationship between on-the-job experience and material learned in the classroom.

"Employers are increasingly looking for college graduates who have had experience in the area in which they are opting for a job," according to Dr. Philip E. Johnson, Cooperative Education Coordinator. "The new program is designed to offer jobs that relate to what a student is studying in school," Johnson said. He suggested that course material does not necessarily reflect the way things really are in the working world and this is one reason the program was initiated. "Students need to be acquainted with the day-to-day reality of how jobs in a particular field really work."

Furthermore, he suggests that students who get on-the-job experience now will have a greater awareness of whether they want to continue in that field or move on to something different. Available through the new program will be internships and jobs offered by public and private businesses throughout Tucson.

Sen. Dennis DeConcini's Tucson office is presently offering a number of nonpaying internships involving research and organizing reports for the senator, Johnson said. He added, however, that these internships could lead to paying positions. Aside from DeConcini's office, many of the jobs offered through the program are already paying positions. Johnson and five faculty members from the Pima College district are working on developing job opportunities for liberal arts students.

He stressed the fact that the program cannot hire people directly, "but serves as a brokerage between a job and a student. We bring a potential employer and worker together and then leave it up to them as to what happens," he said.

Fifteen hours per week is the minimum requirement for time worked and three credit hours are granted to those successfully completing the program. Students enrolled in the program are required to attend a two-hour weekly seminar dealing with issues general to the world of work, such as the concept of human relations in the working environment, planning, writing a resume, and taking a job interview.

Interpersonal skills—relating and communicating better with supervisors, customers, employees, and with other workers—are stressed as the learnable skills relevant to students. In planning, each student takes a hard look at his/her existing situation in terms of career and personal life, does some goal setting, and then develops an action plan appropriate to get from here to there.

In this liberal arts program, Pima is trying to go well beyond the traditional application of job skills that one learns in the classroom. Students become a part of an experiential cycle where they are helped to look at their total experiences, jobs as well as other experiences, and become their own theoreticians; to take a look at the world around them; and to orchestrate their own resources. The point here is to become a learner rather than merely learned.

SOURCE: Adapted from David Bischoff, "New Program for Liberal Arts Students," Aztec Campus News, February 4, 1981.

Or change could be made at the department head or supervisory level so that there is cross-pollination. A vocational supervisor could supervise the academic instructors, or an academic supervisor could supervise the occupational instructors, or a vocational/academic supervisory team could supervise both academic and vocational teachers. In Dauphin County Area Vocational School in Pennsylvania, for example, departments were abolished and occupational clusters, each with its own academic instructional team, were formed. Each cluster elected its own cluster manager, who could be either a vocational or academic instructor.

What procedure will be followed to integrate the curricula? Typically a procedure similar to the following is used to plan the integrated curriculum:

1. Occupational instructors work with their advisory committees to identify or update a list of essential, entry-level occupational skills (tasks, competencies). The two key words there are essential and entry-level. One barrier to increased academics often mentioned is that some vocational teachers think they need more time to cover their content as it is; with less time, they fear that students will not be adequately prepared for employment. The evidence from integrated programs does not support this claim. On the contrary, students who possess essential, entry-level skills, as well as strong basic skills, are better prepared for employment--and for a lifetime career in a rapidly changing world.
2. The academic skills involved in each occupational skill are identified. Initially, vocational teachers and occupational advisory committee members may perform this task. Experience indicates, however, that this can cause frustration because they may lack the specialized terminology to describe academic skills. If possible, then, involving academic teachers in this task can facilitate its completion.
3. The vocational instructors develop a course of study based on the occupational skills identified. The academic instructors develop courses of study based, at least in part, on the academic skills identified (other academic skills may be required for graduation; see sample 7).
4. The academic and vocational curricula are compared and correlated as much as possible. By correlation, we mean that if the math teacher is teaching a particular theory during the first week of October, then the vocational teacher should be teaching a skill that requires the application of that theory during that same week. Those experienced in integrating programs caution, however, that a perfect dovetailing of content is impossible. Some skills in each area are prerequisites of other skills; they must be taught in a particular sequence, and the academic and vocational sequences may sometimes be at cross-purposes. In addition, schedules slide a bit based on how long it takes students to master each skill.
5. Academic and vocational teachers work together to plan how individual lessons can be correlated. Vocational teachers provide the academic teachers with relevant examples and terminology to use in teaching a given theory or skill. Academic teachers provide the vocational teachers with suggestions for activities requiring students to apply the theory and practice the skills.

SAMPLE 7

SECONDARY-LEVEL BASIC SKILLS OBJECTIVES

Reading

A. Basic Word Meaning

1. Identify the meaning of commonly used words within a sentence that does not provide clues to the meaning of the word
2. Identify the meaning of a word within a sentence that provides clues to the meaning of the word

B. Literal Comprehension

1. Identify the meaning of a written phrase, clause, sentence, or paragraph
2. Demonstrate the ability to follow directions
3. Identify the main idea, supporting details, and conclusion of a paragraph
4. Recognize the sequence of events or ideas in a written passage
5. Identify information on a chart, map, or graph

C. Interpretive Comprehension

1. Draw conclusions implied in a paragraph or passage
2. Identify cause-and-effect relationships implied in a paragraph or passage
3. Predict an outcome implied in a paragraph or passage

D. Evaluative Comprehension

1. Identify a statement as fact or opinion
2. Identify the writer's purpose in a paragraph or passage written to inform or persuade

E. Locating Information

1. Use the parts of a book
2. Locate information in a variety of sources

Writing

Given the opportunity to use a dictionary, students, through their own writing samples, will demonstrate—

A. Knowledge of the Subject

1. The writer has something to say
2. Ideas are supported with relevant details

B. Clear and Consistent Purpose

C. Organization

1. Ideas are related
2. Ideas progress logically from one point to another

D. An Awareness of the Intended Reader

E. Precise Word Choices

1. Words appeal to the reader's senses
2. Words suit the purpose
3. Words are appropriate for the intended reader

F. Fulfillment of the Purpose

1. Adequate information is provided
2. The writing is free of irrelevancy
3. The conclusion reemphasizes the purpose

G. Correct Capitalization and Punctuation

SOURCE: Massachusetts State Department of Education.

H. Correct Spelling

I. Legible Handwriting

J. Complete Sentences

K. Standard Use of Nouns, Pronouns, Verbs, Adjectives, and Adverbs

L. Agreement of Subject and Verb

Mathematics

A. Number and Numeration Concepts

1. Recognize number symbols, whole numbers, fractions, decimals, and powers of 10
2. Identify odd and even numbers
3. Put numbers in numerical order
4. Recognize equivalent fractions

B. Arithmetic Computation

1. Add, subtract, multiply, and divide whole numbers
2. Add and subtract mixed numbers
3. Multiply whole numbers or money by fractions
4. Add, subtract, multiply, and divide decimal numbers
5. Change a fraction to a decimal
6. Find a percent of a number (simple interest, discounts, commissions, and taxes)
7. Use ratio and proportion (mixtures, recipes, scale drawings)
8. Use simple formulas

C. Estimation and Approximation

1. Round off numbers to a specified place
2. Approximate the answer to a computation problem (including discounts and percentages)
3. Estimate length, weight/mass, capacity, time, temperature, area, and volume
4. Estimate with money

D. Measurement and Geometry

1. Choose an appropriate unit of measurement in the U.S. customary system
2. Choose an appropriate unit of measurement in the metric system
3. Choose an appropriate measurement instrument involving both U.S. customary and metric units
4. Convert common measurements within the same system
5. Read a scale drawing
6. Use a map to compute highway distances
7. Relate total cost and cost per unit
8. Compute by using temperature
9. Compute by using time
10. Identify right angles and parallel, perpendicular, and intersecting lines
11. Recognize that an object has the shape of a square, rectangle, triangle, or parallelogram
12. Identify the radius, diameter, and center of a circle
13. Recognize that an object has the shape of a cube, cylinder, or sphere
14. Find the perimeter of a triangle, square, and rectangle
15. Find the area of a triangle, square, and rectangle
16. Find the volume of a cube or other rectangular solid

E. Graphs and Tables

1. Read a table
2. Interpret a bar graph
3. Interpret a circle graph
4. Interpret a line graph

F. Prediction of Events and Statistics

1. Understand probabilities like those used in weather forecasting or lotteries (the chance something will or will not happen)
2. Find and use averages (mean and median) for a group of numbers

In some institutions, two types of basic academic skills are identified. By comparing the academic skill lists for all occupational programs, **common-core** basic skills are identified--skills needed regardless of what occupation a person is preparing to enter. A second group of basic skills can then be identified--those that are **occupation-specific.**

Your committee will need to map out a procedure--perhaps a variation of the one described--that will meet your needs.

What curricular materials will be required, and how will they be secured or developed? This question, if not answered wisely and well, can be the basis for a good deal of discontent. Many institutions list the lack of resources for the teaching of applied academics (textbooks, guides, software) as a major barrier.

The lack of resources is particularly critical given that, in many cases, students in a class will represent a wide range of ability levels. Thus, it is recommended that the classes be **individualized** as much as possible. If the total vocational program is competency-based and individualized, adopting the same approach for the academic subjects should not constitute a major problem. If conventional group-based, group-paced instruction is the institutional norm, however, individualization--particularly without adequate, appropriate curricular materials--can seem an awesome task.

There are some strategies that have been used successfully to fill the gap. Team teaching can be used--perhaps a vocational shop or related instruction teacher teamed with an academic teacher. In that way, the vocational teacher can work with a large group at times, allowing the academic teacher to provide students having difficulty with the extra help they require. More advanced students can tutor slower or less capable students. If software is available, students can work with a computer to learn and reinforce skills. Independent study can be made available to more capable students.

Another option is to assign students to academic classes, not by occupational area, but by ability level. This option is suggested with reservations, however. Unless the clusters of occupations represented in each class require similar academic skills, you are defeating the integration effort, which requires that academic content derive from occupational content.

Although materials are still needed for some areas, particularly communication, some materials are already available or in development. The Center for Occupational Research and Development (CORD) and the Agency for Instructional Technology (AIT) have developed applied science courses for secondary and post-secondary vocational-technical students, entitled Principles of Technology and Unified Technical Concepts. CORD is also developing materials for applied math, and AIT is developing materials for communications.

Practical Exercises in Applying Knowledge (PEAK) is a program of secondary school curriculum materials developed by the National Center for Bell and Howell Publications Systems. PEAK places students in real-life situations by relating academic skills to the workplace. With a teacher's guide and series of student exercises, PEAK relates courses in math, science, and office and marketing education to today's careers.

In some cases, you may be able to locate state- or locally developed materials through such sources as the National Network for Curriculum Coordination in Vocational and Technical Education (NNCCVTE)--either directly or through the NNCCVTE state liaison representative in your state department of education. In general, however, administrators are finding that teachers are more likely to use such materials if they develop them--or at least adapt them--themselves. All of which raises another potential barrier. Curriculum development takes a lot of time and special skills.

Your committee, therefore, needs to (1) identify what materials will be required for the integrated program you have planned; (2) identify what appropriate materials are already available; and (3) determine what, if any, development work will be required. This brings us to the next question.

What other logistical arrangements are needed to support the effort? If teachers will be required to develop curricula, how will they be trained to do so? Who will be available to help them? How will the needed time be provided? If academic/vocational teams do the development, how will the schedule be arranged so they can meet as needed? Will clerical support be available to type the materials, with a reasonable turnaround time involved? Can teachers be given access to word processors?

What incentives can be provided to encourage curriculum development? In Massachusetts, for instance, staff at one center who are skilled in the development of learning activity packages (LAPs) offer training and assistance to others in the state. The trainers are rewarded with leadership status and public recognition for their skills. The trainees are rewarded with success, coauthorship for each completed LAP, and a stipend.

How, in general, will you support the need for increased interaction and cooperation between academic and vocational teachers? If teachers are to correlate their teaching efforts, help each other plan lessons integrating curricula, team teach, and so on, they need time and a place to work together. Can they share an office and a planning period? Can they be given extended service contracts to plan and develop curricula in the summer? Will regular meetings (e.g., once a week) be held? Can they be given a reduced teaching load for a period of time to do the required initial planning and development? Can class periods be shortened in length? Can the school day be extended?

Will academic and vocational teachers be required or encouraged to visit each other's classes? Will the schedule permit this? Daily? Periodically? If not, can substitute teachers be used occasionally to free teachers up to make such visits? Such visits can do more than just increase teachers' awareness of the content they need to integrate into their own classes through examples and reinforcement. It also conveys to students that they are in a **total** educational program, working with a vocational/academic instructional **team.** It shows that each teacher is interested in the content being taught by the other. It provides a model.

Notice that support issues keep coming back to **time** concerns: time to plan, time to meet, time to share. This one concern can make or break the integration effort. If teachers cannot reasonably find the time to get together, they are unlikely to do so. Without this interaction, there can be little cooperation, correlation, or integration. Little team spirit will be

built. If, however, at a bare minimum, teachers are required--and able--to meet for ten minutes a day, that sharing is likely to become a habit.

One very effective way to provide time is to phase in the change over an extended period. This not only provides more options for building in the time needed for planning, developing, and implementing the innovation; it also provides time for the participants to go through the change process to the point where the innovation is routinized, refined, and institutionalized--an integral part of the curriculum. In the words of Gene Hall--

> You can't do everything at once, so don't try. One of the largest hoaxes being carried out in the American education scene is the maintenance of the impression that school systems can implement everything on top of everything else and do it successfully.[12]

Another crucial issue is adequate **training.** Inservice training needs to be available so that teachers are adequately oriented to the integration approach to be used. They may also need training to perform the occupational and task analyses required and to use the task analyses to identify academic skill requirements. They will undoubtedly need training prior to developing curricular materials, such as LAPs. Can you offer local inservice training sessions? Can such training be provided more efficiently in some cases through annual state conferences? Can academic teachers be invited to state vocational teacher conferences to (1) promote sharing of ideas and materials, (2) reinforce the idea that teaching vocational students is an academic/vocational team effort, and (3) underscore the state's commitment to academic/vocational integration?

Finally, if teachers are working hard to learn new skills and more about the subject area with which they are correlating their subject matter, some reward should be forthcoming. Support in the form of a thank you, publicity concerning a job well done, or staff development credits should be provided. Be creative in your thinking in regard to support. Don't limit staff development credits just to such traditional activities as training workshops. The vocational teacher who works hard and successfully to improve his/her English skills by auditing the English teacher's classes, seeking that teacher's help in private, and studying related texts deserves tangible credit. Likewise, the academic teacher who substantially improves his/her knowledge of the occupational area through attending vocational classes and making on-the-job visits deserves tangible credit.

Some additional forms of support may be crucial if job security is threatened by the new program. For example, if increasing academic requirements will increase academic staff and decrease vocational staff, good sense suggests that teacher morale may suffer if staff are terminated without concern for their plight. You could instead plan to handle the reductions through retirements and attrition. Or you could provide support for teachers to secure additional certification (e.g., fee waivers, tuition reimbursement) such that they could remain in the system in another function. This can be beneficial to both

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12. Gene Hall, "Meeting the Concerns of Users: A Way to Implement Competency Testing," paper presented at the conference, Here Comes Competency Testing! Are You Ready? Boxborough, Massachusetts, May 1978, p. 32.

teacher and students. Having academic teachers with academic **and** vocational certification can greatly facilitate the integration of content and enhance students' perceptions about that teacher's credibility.

The planning committee first needs to identify the types of support required on the basis of the proposed integration effort. Then, considering the present scheduling system, facilities, teacher contracts, and budget, decisions must be made about what can be done, as well as what changes to the status quo must occur in order to provide the needed support.

What about money and other resources? What level of funds will the proposed effort require? How much money is presently available to cover the proposed activities? How much additional funding will be required? And what funding sources are available to you? We have already mentioned the support available through the Perkins Act and through state funding sources. Resources may also be available through private foundations or through business and industry, if you can document that your program will meet one of their priority needs.

What next? Once all questions have been answered, the committee should arrange to have the program proposal prepared in writing so everyone is clear on the nature of the program, the structure of the program, and the procedure to be followed in establishing the program. At that point, you are ready for the next stage of the preparation step: preparing people.

People Preparation

Part of people preparation is orienting them to the proposed effort and seeking their input. Part is marketing the effort and securing their commitment and enthusiastic support. And part is preparing them to carry out their assigned roles and responsibilities.

Input. With a detailed written proposal, you can efficiently seek reactions and input from those people who will be involved in the change, whose support you need, and/or who have an interest in the program. It is usually a good idea to start with key district or institutional decision makers and then gradually to involve more and more groups, progressing from those most affected to those simply interested. In that way, you can use the support you've gained to gain support at each successive level.

The particular approach you use will depend on your structure and situation. In the Great Oaks Joint Vocational School District (Cincinnati, Ohio), the following groups were contacted and involved, in the following order:

- Local school superintendents
- District staff (administrators, teachers, support staff)
- Local administrators (principals, curriculum directors, counselors, county boards)
- Parents and students
- Other community groups (teacher councils, local administration, Rotary, Kiwanis)

Perhaps, as an ardent believer in the importance of advisory council/committee involvement, you are wondering why they are absent from the list. If you remember, they were actively involved in the development of the proposal. They should not need to be oriented at this point, and their support should already be assured. They can, however, be involved in orienting others and seeking their input, particularly when their own peers are involved (e.g., Kiwanis).

Once you have ensured that all the voices that should be heard, have been heard, you can review the input and revise the proposal to reflect that input insofar as is reasonable and practical.

Support. Gaining support for the proposal will in part occur **while** you are seeking input, but further efforts are also required. In addition, to gain support, you need to plan your orientation and subsequent training activities with marketing principles and change process theory firmly in mind.

Through attention to the change process, you can ensure, to a great extent, that the information you provide at each point meets the concerns of the group being addressed. This, in turn, will help you to market the effort successfully.

For example, in addressing vocational teachers, they may have the following concerns:

- Am I in danger of losing my job?
- Am I being asked to relinquish control over what I teach?
- How will I find time to cover the vocational content if more time is spent on academics? How can I adequately prepare students for employment if I don't have time to do so?
- If students' basic skills and knowledge of academic theory get to be better than mine, won't I lose my credibility?
- Will I have to teach basic skills? How will I develop the skills and find the time to do so?
- If we prepare students with strong basic skills and transferable occupational skills and they secure employment outside the occupation, we won't get credit for job placement, and the program will be in jeopardy given the present state accountability system. What then?

Academic teachers may be concerned about their ability to relate academic subject matter to occupational reality. Some may be concerned about the wisdom of doing so; they may be determined to keep their subject matter "pure," not watered down with "mundane" content.

Both academic and vocational teachers may be seriously concerned about the amount of work involved in the change, and how they will find the time and the strength to carry it out.

Students often select the vocational program, not just because it meets their occupational goals, but also because they are concrete learners who have not done well or been much interested in academic course work. Thus, they may be concerned that they've leaped out of the frying pan and into the fire when

they learn they haven't "escaped" academics; they may feel that once again they are in a program in which they can't expect to succeed.

If one of your audiences is home school administrators, they may be concerned about loss of enrollments. They may think that if they help you integrate academics into the vocational program, they will lose the students they need in order to maintain funding levels.

If you have done a thorough job in developing your proposal, you will have anticipated these concerns and will be prepared to respond to them to most people's satisfaction. One key strategy is (1) to focus on the **total program** as preparation for employment and for the future; (2) to stress that academic and vocational teachers are **equal** partners in providing the instruction; and (3) to emphasize that students who want to enter, survive, and advance in the world of work need all parts of the total program to do so.

In addition, **terminology** can be very important in marketing the integrated approach. At Great Oaks, the applied academic courses and entrepreneurship/employability courses are called Integrated Technical Foundations, thus underscoring that they are an integral part of the technical program. Calling the English course Communications may be far more appealing and may make the course seem far more relevant and achievable to students. Calling academic courses Applied Academics can also serve to reinforce the relationship between academic and vocational content.

In fact, in reading the enormous number of "liberal arts versus vocational education" articles, one wonders how much of the debate is semantic in nature. One encounters a variety of terms: basic skills, generic skills, literacy skills, transferable skills, classical education, general education, liberal education, liberal arts, liberal learning, humanities, academic education, academics--the variations are seemingly endless. Some terms describe programs or curricula; some describe broad educational approaches. Often, people using different terms are in fact talking about the same thing.

If all these programs are designed to prepare students for lifelong educability and "the next step," which is either further education or entry into an occupation, things could be greatly simplified if two simple terms were used to describe these efforts: liberal education and vocational education. Unlike liberal arts and vocational training, each of which is a specified curriculum, liberal education and vocational education are approaches to education--with more similarities than differences.

An effective liberal education may stress academics as preparation for further education, but it also needs to include employability and employment skills and may include occupational skills (not all college-prep students actually attend college--or graduate). An effective vocational education may stress occupational skills, but it also needs to include academic and employment/employability skills (i.e., a liberal education). In short, these are not-so-different approaches to the same goal, each designed to prepare students for the next step they wish to take and for lifelong learning.

In addition to attention to terminology, you need **honesty**. If vocational staff will be reduced, say so--**but also** counter that with information about the

provisions that have been made to minimize negative effects. If vocational instructional time will be reduced, say so--**but also** explain why the end result will be a better-prepared and more employable student, and support your explanation with hard data, such as the results from employer surveys. If the integration effort is being implemented in response to a state mandate, say so--**but also** emphasize the excellent opportunity this mandate provides to meet your **local** mission. If a great deal of work will be involved, say so--**but also** enumerate the support mechanisms you are proposing.

Remember, too, to **accentuate the positive**--the challenge. For example, in a welcome to participants in the inservice sessions for Program Options in Ohio, participants were congratulated for "meeting an exciting and significant challenge in vocational education programming." They were briefly told about what Program Options involves, and the benefits were stressed. They were briefly introduced to the factors that converged to make changes in vocational education programs a necessity: business and industry requests for entry-level employees to have a more thorough knowledge of basic academics applied to their vocational fields; the public's increased expectations regarding academic outcomes of educational activities, heightened by all the national reform reports; increased graduation requirements and declining vocational enrollments in Ohio; and the emphasis in the Perkins Act on the need for strengthening academic foundations. And then they were told--

> Note that none of these reasons is based on failure of teachers--academic or vocational--to "do their job." Rather, these reasons are part of a collective set of circumstances that have led vocational educators in Ohio to look to new pathways to vocational education excellence.
>
> School districts choosing to implement the options are by nature leadership oriented, and you have been selected to be part of this pioneering leadership effort. Pioneering involves risk and challenge--primarily from the new, the different, the change from the status quo. Likewise, pioneering efforts bring about a unity and kinship that often allow outcomes that surpass expectations. The results will be worth the hardship.

Challenge, not burden. Opportunity, not imposition.

Readiness to perform. When you have support for your effort and teachers are at the stage in the change process where they are ready to commence, you need to initiate the inservice training provided for in your plan. If you are starting with a pilot effort, you may be working with a small group of teachers, selected for their enthusiasm, willingness to experiment, and perhaps their role as opinion leaders. On the other hand, you may be training all teachers in the institution or district.

Regardless, ensure that inservice sessions are conveniently scheduled and located. Make every effort to use the sessions not only to provide needed training but also to build vocational/academic team spirit. And do not lose sight of the change process, individual needs, and the continuing need for administrative enthusiasm, support, and visibility.

Chapter VI

IMPLEMENTING, EVALUATING, & BEYOND

The implementation process should be fairly straightforward if your planning is sound and your staff have been properly oriented, adequately sold, and appropriately trained. Two keys to a smooth implementation are (1) a sound evaluation plan and (2) your **continued** attention and support as an administrator.

Evaluation. Program evaluation is not something you think about and perform after the program has been installed. It needs to be an integral part of the implementation process from beginning to end.

Formal and informal evaluation during implementation (formative evaluation) provides the kinds of information you need in order to identify problems quickly. In that way, you can correct any problems before they can cause major damage in terms of staff frustration and program progress.

Formal and informal evaluation at the end of the implementation phase (summative evaluation) provides the kinds of information you need to document how successful the program has been. This type of information can be essential in **developing reports** for an agency funding the effort and in **promoting the effort**, both externally and internally. It is also essential information for the future. If you are genuinely committed to making an integrated academic/vocational approach an integral part of your institution's instructional delivery system, then you need to constantly modify and improve that approach to rectify problems and respond to changing condition or needs. To do so, you need a sound, factual basis for making decisions. A carefully planned and systematically carried out evaluation effort can provide that basis.

Continued attention and support. You may have staff so well prepared and so team-oriented and so well supplied with support systems that nothing could possibly go wrong. You may have appointed a local coordinator to oversee the effort to further ensure that nothing goes wrong. Nevertheless, **your** continued attention and support are required.

When asked why innovations succeed or fail, time after time one key factor is the amount of administrative leadership and visible support. It may sound hackneyed--of course that support is needed--but the importance of that leadership role is often underestimated. It is easy for an administrator to become so busy that providing broad overall leadership to the institution, with specific responsibilities delegated to competent administrative staff, may seem sufficient.

Broad overall leadership is not sufficient. The implementation of an integrated program involves major change, structurally and attitudinally. It will require a prolonged period of staff effort. If you want staff to maintain their motivation throughout that period, your commitment must be continuing and explicit. Staff must feel that you are very aware of the progress being made, and you must make your appreciation felt, in ways both large and small. Staff

must also be confident that as needs arise, your door is always open (within reason).

If you want to rear a mature program, in other words, you can't simply plant a seed and then move on to other things. You must continue to nurture that program--as well as the people responsible for its implementation.

Beyond

There is much to be done in implementing an integrated approach, and some of the pieces required to facilitate that type of approach are not readily available as yet. Those who are implementing integrated programs have identified several gaps that need to be filled. As your program becomes more firmly established and the dust settles, therefore, you could choose to further the cause by working to fill some of those gaps or lobbying to ensure that others fill them. The following concerns are among those identified.

Need to improve the integration of skills at all levels. Educational solution strategies so often start--and end--at the teacher level, perhaps because teachers have the most direct contact with students. But who is providing a model for the teachers? We need to work to ensure that academic and vocational educators in the state department and in the universities and in local districts communicate and cooperate. We need to work toward the day when teachers assume that instruction will be integrated because that is how they themselves were taught.

Need to improve the level of basic skills at all levels. To integrate basic skills into their curricula, vocational teachers need strong basic skills. For vocational teachers to have strong basic skills, the people preparing them to teach (professors, teacher educators, supervisors) must have strong basic skills. In theory they do; the reality sometimes falls short.

Take writing skills as an example. Documents written by individuals with doctoral degrees vary in quality. Some are superb and most are adequate. But some (too many) are full of lofty words signifying nothing, or are so poorly organized they defy understanding, or are barely literate. And the real tragedy is that most of these individuals have been led to believe that they **can** write, which authorizes them to use their poor skills as a measure in teaching others.

If some professors of doctoral students can't write or recognize good writing, then some doctorates will be earned by poor writers . . . who teach teachers . . . who teach students. And so the cycle will continue. It must be broken. Otherwise, improving **students'** basic skills will always be a flawed effort. The fifth-grade teacher with a master's degree who sent home the following note **cannot** be expected to improve students' communication skills:

> Scott is dropping in his studies he acts as if he don't Care. Scott want pass in his assignment at all, he had a poem to learn and feel to do it.13

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13. "Help! Teacher Can't Teach!" Time, 115 (June 16, 1980): 57.

Need for more curricular materials to support the teaching of applied academics. Materials that relate academics to occupational content seem to be particularly scarce for the communication area. More is available for science. Quite a bit is available for math. Software that could be used to individualize instruction is also lacking.

Actually three related needs exist: the need to identify thoroughly what is available, the need to develop additional materials to fill any gaps identified, and the need to keep the field informed about what is available.

Some work is going on in this area already. In Arkansas, for example, they are in the process of identifying and evaluating available software. They will be producing a bibliography of their findings.

A future challenge you could tackle is to help develop a network for sharing such information and materials. You might consider tapping into an available organization, such as the National Network for Curriculum Coordination in Vocational and Technical Education (NNCCVTE), and promoting the need to share locally developed materials through that organization.

Need for appropriate diagnostic tests. As you will discover in Part 3 of this guide, programs trying to improve students' basic skills in response to their actual needs are making use of some commercially available standardized tests and/or state- or locally developed tests.

Three problems have been identified. One is that many tests do not test basic skills in relation to occupational needs. Second, many tests are norm-referenced, rather than criterion-referenced; so you discover that a student is in the 45th percentile or reads at an eighth-grade level, but you don't know what specific skills he or she lacks. Third, there are few tests available for some basic skills, such as writing and listening; and those that are available are time-consuming to administer and evaluate.

Again, some test-item development is underway (see sample 8 and the models in Part 3), but more is needed. This is another challenge for the future.

Need to encourage "the best and the brightest" vocational students to consider teaching as a career--or as one step in their overall career. When your excellent integrated program is producing students who possess strong occupational skills, solid skill in learning and in solving problems, and sound basic skills, who better to go on and prepare to teach future students? In that way, excellence can be perpetuated, surely a worthy goal.

SAMPLE 8

TEST ITEMS

The Division of Vocational, Adult, and Community Education (DVACE) is seeking teachers to contribute usable test items during this initial year of operation of the new vocational test-item network. All sixty-seven districts have named an individual to serve as the district's vocational assessment coordinator (VAC). The VACs comprise the network and serve as the district contact persons for questions, activities, and issues related to test-item development. This year, test items, item writers, item reviewers, and potential field test sites will be needed in the areas of (1) accounting occupations; (2) food management, production, and services; and (3) health service occupations.

The Omnibus Education Act of 1984 (Chapter 84-336, Laws of Florida) included a section known as Florida Accountability in Curriculum, Educational Instructional Materials, and Testing (FACET), focusing on increased student performance through a renewed emphasis on academics. The FACET principles (or guidelines) . . . include the development of model standards for effective and comparable evaluation and testing procedures among school districts. Student achievement test score results by program, including vocational programs, will be used to identify and improve programs which are most deficient in student performance.

Test items developed over the next several years will be placed in a test-item bank for potential use in the statewide achievement testing effort.

SOURCE: Dee Wilder, "Test Items Under Development," Florida Vocational Journal (Jan/Feb 1986): 23.

PART THREE
INTEGRATION MODELS

The "models" in this section are not all fully realized exemplary programs, with all the snags worked out. They are models of programs in process--programs that are working to integrate academic and vocational education, programs that are in various stages in relation to that effort. All have something of value to offer for those seeking to do the same. The model descriptions have been drawn from materials shared with us by the program developers; their great willingness to share is much appreciated.

VII. ACADEMIC SKILLS

Model Arkansas Post-Secondary Vocational-Technical Schools (APSVTS)

Description

In Arkansas' postsecondary vocational-technical schools, students at three pilot schools will have access to a Unified Technical Concepts course (the postsecondary-level version of Principles of Technology) starting in the fall of 1986. The focus of this description, however, will be on another part of the academic offerings: a statewide standardized math and communications program.

In 1983, two doctoral students at the University of Arkansas conducted competency studies, one on basic mathematics and one on basic communications. Both studies focused on the specific competencies, with core curriculum recommendations required, for a standardized postsecondary vocational-technical core curriculum.

A 63-item math questionnaire and 55-item communications questionnaire were prepared and field tested. The math questionnaire was based on a sequential list of mathematics competencies. The communications questionnaire included competencies pertaining to speaking, listening, reading, writing, and relating. These questionnaires were administered to the following five source groups to establish which competencies were deemed essential for every graduate of the APSVTS system:

- Vocational-technical school administrators
- Vocational-technical instructors
- Mathematics instructors or communications instructors
- Vocational-technical graduates
- Craft advisory council members

These groups represented not only those cognizant of the skills needed by graduates but also those who would be affected by curriculum change. Thus, the questionnaire was an **awareness tool** as well as a **research tool.**

The data were analyzed according to (1) the type of program or occupation the respondent was involved in, (2) the region of the state represented by the respondent, and (3) the respondent's position. Findings indicated that all groups perceived basic skill needs to be fairly similar and identified the same competencies as important.

Thus, if someone challenged the overall results with "that may be true for that region (or occupation or position), but it's not true for my situation," the data could prove otherwise. The survey results have been useful as a **marketing tool.** The developers found this to be critical. It needs to be made clear at the outset that there is a **need** or people won't get involved, won't be supportive. Hard data, local data, can establish that need.

Once the essential competencies were identified, a basic skills curriculum was developed, using the MAVCC format (Mid-America Vocational Curriculum Consortium; 1500 West Seventh Avenue; Stillwater, OK 74074). "Student Curricular Guides" contain unit objectives, information sheets, and assignment sheets for each course. Student copies of the unit tests are packaged separately and are issued to the instructors. Instructors' guides contain the student version of the guides, as well as copies of tests and answer keys for assignment sheets and tests.

Ten competency-based curricular guides and tests were developed--five for each discipline. The guides and tests deal with generic math and communication skills. The instructors in the state who wrote the curricula used real-world examples and stressed readings that made use of technical vocabulary. The curricular guides were not developed to stand alone as instructional units or to be considered set in stone; they are designed to serve as **guides**. They are available to instructors in the state through the curriculum dissemination center at the University of Arkansas.

The resulting math and communications program provides courses at three levels--Pre-Tech, Tech, and High-Tech--depending on students' skill levels. The program works as follows. All new students who register for a vocational-technical program are assessed for math and communications placement. Math skills are tested using the Stanford Diagnostic Mathematics Test - Blue Level (117 multiple-choice items). Communication skills are tested using the Test of Everyday Writing Skills--TEWS (100 multiple-choice items). TEWS also requires students to produce a writing sample; this is used by instructional staff working with the students, but it is not used in placement.

On the basis of their scores and their vocational-technical program area, students are then placed in the appropriate courses, as follows:

- Students who score 50 percent or less on the entrance placement tests are placed in Pre-Tech Courses, which may be taught by Adult Basic Education instructors. Pre-Tech Communications is designed to establish the speaking, reading, and writing competencies required for basic literacy. Pre-Tech Mathematics is designed to develop arithmetic competencies, with emphasis on whole numbers, decimals, and addition and subtraction of like fractions. These students may be allowed to conditionally enroll in regular program courses while removing the deficiency.
- All regular program students who score between 51-84 percent on the placement tests are required to enroll in Tech Courses, which are taught by math and communications instructors. Tech Communications I is designed to develop listening, speaking, reading, writing, and human relations skills, with emphasis on the skills required in an employment setting. Tech Mathematics I and II are designed to develop skills in fractions, decimals, percents, measures, tables and graphs, and calculator usage.
- **All** regular program students are required to enroll in the Tech-level Course, Tech Communications II, which examines the communication techniques involved in a successful employment interview and includes an introduction to self-improvement and nonverbal communication.

- Students in selected programs are **required** to enroll in High-Tech Courses. Students who score 85 percent or higher on the placement tests or who complete Tech-level Courses may **elect** to enroll in High-Tech Courses. The four High-Tech Courses offered are Technical Writing and Speaking, Technical Management and Supervision, Algebra and Geometry, and Trigonometry.

Once a student has been enrolled in a course and the instructor has had sufficient time to evaluate the student's progress, the student may be allowed to test out of the course. This procedure is administered at the discretion of the instructor.

In short, APSVTS students must demonstrate competence in three areas: occupational, math/communications, and employability. In the area of math/communications, students must pass a common core of competencies. may take some electives, and may need to develop some course-specific math/communication skills. The MAVCC-type curricular materials for math/communication are related to the world of work.

In terms of academic/vocational instructional teaming, some problems remain to be solved. First, vocational instruction time was originally six hours per day. Now, when students take math/communication courses, it comes out of those six hours. Students' time involvement with these classes varies, depending on individual needs for skill development. A student may be gone from the vocational program from one to two hours per day and from one to six quarters.

This situation makes it more difficult to secure the cooperation of the vocational-technical instructors. In addition to which, there is evidence that some nondegreed instructors feel threatened by the program and the fact that their students may be learning something they don't know well themselves. If the vocational instructors have a negative attitude toward the math/communications program, this can affect students' attitudes. To remedy these problems, it is crucial to help the vocational-technical staff to recognize that basic skills **are** job-survival skills and should be an equal part of occupational training.

Second, without occupational training, academic instructors have some difficulty in making basic skills instruction apply to students' occupational areas. Students need to deal with the academic concept and its occupational applications at the same time. One solution being used is to bring the academic instructors into the shop and to demonstrate for them the applications of academics to vocational training.

Another facilitator in this regard is that Arkansas provides statewide in-service training twice a year for two days each for postsecondary math and communications instructors. During these sessions, opportunity is provided for small-group sharing of successful techniques. Plans for the future involve including vocational instructors in these meetings to promote vocational/academic sharing. Possible presentations could include having a guest speaker from industry talk to new instructors or having a vocational teacher of applied academics speak to academic teachers about needs, concerns, and strategies.

One additional concern that was mentioned was that some vocational-technical students perceive a vocational program to be an **alternative** to academics. They

are in vocational education to get away from academics. Thus, their initial response to having to take academic courses may be negative. Students need to understand that basic skills are an integral part of both the curriculum and the world of work--and counselors must support this.

For More Information

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VIII. ACADEMIC SKILLS

Model Pathfinder Regional Vocational-Technical High School District, Palmer, Massachusetts

Description

State level. In November 1975, the Massachusetts State Board of Education began a major policy review of the need for minimum standards for high school graduates in Massachusetts. An Advisory Committee on High School Graduation Requirements was later established to help in this effort, and after several years of deliberation and public discussion, the state board received and endorsed the advisory committee's report.

On the basis of the recommendations contained in that report, as well as formal position papers received from educational groups in the state (e.g., teachers associations, principals associations, student advisory councils), the state board adopted a Policy on Basic Skills Improvement in August 1978. The state board stressed in the policy statement that the purpose of the policy, and of a basic skills competency program, is to assist all students in achieving mastery of basic skills prior to high school graduation through the provision of appropriate curriculum, instruction, and evaluation.

As evidence of its commitment to and focus on **improvement**, the board states that emphasis should be on diagnosing learning needs and adjusting the regular curriculum to these needs so that all students can attain minimum standards, rather than on testing and retention. Furthermore, the 1978 policy states that the board has been convinced that it should not, at this time, adopt a policy that makes awarding of the high school diploma contingent on satisfactory performance on any single test of basic skills competency.

The policy, endorsed by the major educational associations in the state, established a statewide program of achievement standards in five basic skill areas: reading, writing, mathematics, listening, and speaking. Implementation of the policy was made the responsibility of the local school committees, who were charged with (1) establishing minimum standards for each area (reading, writing, and math by September 1980; listening and speaking by September 1981); (2) deciding by which specific grade or grades these standards should be attained; (3) deciding how achievement of the standards will be measured at each level; and (4) providing for public participation in the development and periodic review of the standards.

The state responsibilities included devising a state test of basic skills for the secondary level and making it available for **optional** local use, issuing a list of state-approved commercial tests, conducting workshops to assist local districts in their efforts, and reviewing policy implementation in each region. The intent of the board, thus, was to improve basic skills competency in **partnership** with local school officials.

However, for the sake of consistency, the state is now in the process of establishing statewide standards and testing procedures. The state department is implementing the first statewide education assessment testing in spring 1986,

and this program will expand statewide student competency testing into such areas as science and history.

Another state contribution was to arrange for a statewide employer survey to be conducted by an independent organization. The ten-month study, which began in April 1982, was undertaken to determine the level of employers' satisfaction with the skills of vocational education graduates in Massachusetts. Over 7,300 former students from the classes of 1979 and 1980 were identified and contacted. Data were then collected from approximately 1,550 completers/leavers and 800 of their employers/supervisors regarding several aspects of the former students' vocational training and/or job performance.

The responses of completers/leavers and their supervisors were analyzed separately and by matched pairs for (1) general ratings and (2) evidence of significant differences in these ratings by the completers/leavers' individual (sex and race/ethnic), employment, and educational characteristics. Findings of the study were as follows:

- Employers and supervisors are very satisfied with vocational students' training and/or job performance.
- Employers and supervisors rate former vocational students as better prepared than co-workers.
- Employers' and supervisors' ratings were unaffected by the completers/leavers' individual characteristics.
- Employers' and supervisors' ratings do vary by completers/leavers' educational characteristics.
- Former students give their vocational training high marks.
- Academic preparation lags behind vocational training.
- Former students' ratings vary by educational characteristics.

Teacher education level. The vocational teacher education institutions in Massachusetts, too, support basic skills improvement. The teacher-approval program is based on a list of competencies carefully and systematically identified for the state. The competencies and evaluation indicators require the teacher candidates themselves to continually demonstrate skill in oral and written communication. Furthermore, the evaluation indicator for one competency specifies, "Candidates will examine and discuss written curriculum products from the statewide **math** and **science** project and incorporate such into related and shop lesson analysis blanks provided by the instructor.

Teacher educators are also part of the state's strategy for marketing the integrated approach with instructors. The experience and credibility of the teacher educators have proven to be a real asset. It should be noted, however, that the teacher educators go to the schools to provide the help; the teachers are not required to travel to the university campus.

Local level. The program at Pathfinder Vo-Tech High School is one example of basic skills improvement efforts at the local level. The secondary vocational program is a four-year program (9-12), which allows students to "explore" the various occupational programs during the first semester of the ninth grade before selecting which program to pursue. Students attend classes for five and

a half hours a day, on an alternating schedule: one week of shop alternating with one week of academic and related instruction classes.

Students must successfully complete **four** years each of shop, related instruction, and English. The English requirement at the ninth and tenth grade levels includes both an English course and a reading course. Students must successfully complete **two** years each of math, science, U.S. history, and physical education. Sixteen elective credits must also be earned. Math offerings will be discussed later in this description. Science offerings include IPS/ILS, biology, physics, environmental science, chemistry, and Principles of Technology. Other course offerings include developmental reading, typing, accounting, and social psychology.

Students must pass shop each year and earn 150 credits in order to be eligible for a diploma. One of the criteria for passing shop is that the student be present for 500 shop hours per year; a student missing shop hours must make them up in an approved trade **working** station, not through reading or written work. Upon successful completion of the program, students receive both a Certificate of Vocational Proficiency and a high school diploma.

Pathfinder also offers an afternoon program (2:40-5:40) for students aged 16-21. These students may choose to complete the program with or without the academic component.

The basic skills improvement plan at Pathfinder was developed with teacher, administrator, and public involvement. A school steering committee--consisting of math, reading, and English teachers (two each); an academic department head; and a central office administrator--served as a catalyst for developing the total basic skills plan. As is the case in any decision-making situation at Pathfinder, the school's advisory council was substantively involved.

An outgrowth of the steering committee's efforts was the initiation of a districtwide joint planning approach. By working with staff from the sending schools, they established a mechanism for maximum continuity in students' basic skills training, as well as for further collaboration and follow-up on a districtwide basis.

Students' basic skill needs are identified through testing. In the ninth grade, students are tested on reading in October, math in November, writing in January, and listening in February. The math test is the Massachusetts Test of Basic Skills--Math, developed by the state department, in part from other existing tests that had been developed and proven valid and reliable elsewhere. The answer sheets for the test can be machine-scored. Students must score 74 percent or better to pass. The reading test is also a state-developed, machine-scorable test; students must score 71 percent or better to pass.

The writing test requires students to write a short letter for a stated purpose and a longer essay on a stated topic. Thorough criteria have been developed by English instructors to guide those scoring the writing samples so as to objectify the scoring insofar as possible. Samples are assessed in four areas: reader reaction, content, mechanics, and organization. For each area, very specific elements to look for are provided, and scorers rate each element using a four-point scale, where 1 = poor and 4 = excellent. Scorers are also given very specific indicators for each area concerning what each rating level (1-4)

means. Raw scores are calculated for each area and then totaled and divided by four to produce a final score. Students must score a 2 or greater (holistic scoring) to pass.

The listening tests, presently being tested (1985-86), were developed by an independent contractor. These tests consist of an audiocassette on which different scenarios are described or enacted. After the student listens to a taped scenario, he or she answers questions about the scenario. Theoretically, the test is criterion-referenced.

After the tests have been administered, students who fail to meet the specified standards are given two years (grades 9 and 10) of intensive instruction in basic skills. Detailed computer analyses of the machine-scored math and reading tests and detailed scoring sheets for the writing test provide the remedial instructors with the diagnostic information needed to structure each individual student's program to focus on identified weaknesses.

Students in remedial programs are retested each year and continue to receive remediation until they meet the standards. The numbers of students requiring remediation beyond the tenth grade are not so great as to create scheduling and staffing difficulties.

An example of how the math skills curriculum is structured is as follows:

- Students who do not pass the standards test in the ninth grade take a remedial course. Those with significant deficiencies take **Computational Math**, which starts from scratch with math skill building: addition, subtraction, multiplication, and division of whole numbers, fractions, decimals, and percents. Students with less significant deficiencies take **Math Applications**, which assumes understanding of whole number operations and at least partial mastery of the concept of fractions and arithmetic operations with fractions, and which emphasizes decimals, percents, geometric concepts (metric and nonmetric), and problem solving (including tables, graphs, and formulas).

  Students who continue to require remediation throughout the four years take the following sequence of courses: Basic Skills Math in the tenth grade, Individually Prescribed Instruction (IPI) in the eleventh grade, and Senior Consumer Math in the twelfth grade. **Basic Skills Math** covers development of problem-solving strategies, with review of computational procedures only as necessary to the problem situations. **IPI** uses resource room facilities and teachers to provide individualized math instruction using alternative learning formats and structures. **Senior Consumer Math** focuses on mastery of the math skills most useful for functioning as an adult member of society.

  At whatever point these students do pass the test and meet the standards, they can switch to the regular algebra or math sequence.

- Students who demonstrate at least minimum competency on the standards test must then successfully complete a minimum of two years of math course work. One course sequence is an algebra sequence: Algebra I and II, Geometry, and Trigonometry. A second course sequence is a math sequence: Math Applications, General Math, Consumer Math, and Industrial Math. A student who passes the math standards test in the ninth grade

could start the math or algebra sequence in the ninth grade and complete the total four-year sequence. Or a student could start with the math sequence and switch to the algebra sequence and complete a four-year sequence.

However, only two years of math are **required**. Therefore, minimally competent students may **start** working to meet their math requirements at any point in the four years and **stop** when the requirements have been met. Thus, students who wait until grades 11 and 12 to take math could take two years of the algebra sequence, or Consumer Math and Industrial Math, or Math Applications and General Math, or a combination of courses from the algebra and math sequences.

A number of strategies are being used in increase the integration of the academic and vocational offerings. State minigrants are available for school systems to gain assistance in the development of curricula. Local school systems are encouraged to bring in outside consultants to help identify vocational and related academic competencies. Academic teachers can then plan instruction to cover specific occupationally related academic competencies, and vocational instructors can plan instruction to include application of those competencies. To promote mutual sharing, vocational teachers were asked to identify terms and examples from their occupational areas that the academic teachers could use in their instruction. The academic teachers were asked to identify opportunities for vocational teachers to integrate basic skills in their classes.

Massachusetts' commitment to competency-based education (CBE) also has potential for facilitating academic/vocational integration. As part of the CBE effort, local schools are developing learning activity packages (LAPs) for both the academic and the vocational courses, field testing them, and sharing them statewide. A good deal of state support for this work is available. Minigrants are available. Staff at the regional education center in Lowell have developed a LAP development process and can provide personnel to help teachers write LAPs, for which the teachers get co-authorship credit. Summer programs, attended on a volunteer basis, are also offered. In these programs, teachers identify competencies for their instructional area and then develop LAPs and other curricula. Participants are required to produce tangible products and are paid a stipend for their work.

Another opportunity for formal and informal contact between academic and vocational teachers is provided through the state's annual occupational professional development workshops, which have offered sessions covering topics such as the following:

- Integrating economics into the vocational school curriculum
- Making traditional social studies and English subjects more tangible and "real" for vocational students
- Improving listening skills
- Teaching reading in the content area
- Reinforcing basic skills through home economics

- Implementing cross discipline planning
- Implementing Principles of Technology

Based on their experiences to date, Pathfinder's administration suggest that it is crucial to **market** the new approach--academic/vocational integration--to those who will be affected, or teacher resistance may constitute a real barrier. Everyone involved, furthermore, needs to understand that basic skills are an **integral** part of occupational preparedness. The importance of academics in the occupational program at Pathfinder is reflected in their promotional materials (see sample 9).

If, as is the case in Massachusetts, teacher contracts include strict collective bargaining agreements, then it is especially crucial to get the support of the teachers' organizations and to make sure provision is made for the teacher involvement time needed. This may mean building curriculum development time into the contract through negotiation, or it may mean ensuring that funds are available to pay teachers to work on an extended contract basis.

For the present, they know that, traditionally, students have attended their vocational courses; they have cut their academic courses. The academic teachers with the highest success with student learning and motivation are those who teach academic concepts in vocational terms. Thus, if academics are tied in to the vocational course work more closely in the future, this should be a real benefit to academic attendance--and to students, who need those basic skills.

For the future, vocational educators in Massachusetts are attempting to ensure that, since they are accountable for basic skills development, they get full credit for the basic skills gains that take place. They want the state to measure students' skill levels both on entering and leaving the vocational program. Amount of basic skills improvement, not comparison of the final skill levels of students graduating from different tracks, should, they feel, be the focus of measurements of program success.

For More Information

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SAMPLE 9

PROMOTIONAL MATERIALS

YOUR CHILD'S FUTURE . . .

It Means A Lot To All Of Us

As a parent, you have so many decisions to make about your teenager's future. Security, health and happiness are just a few of the dreams we all share for our children.

They deserve the best; so when it comes to choosing the right education for them, we need to take special care. Your choice will mean a lot to their futures.

FACT: Three out of four jobs in business and industry require vocational or technical training below the college level.

FACT: Vocational technical high schools have the teachers and equipment to train young people for jobs in the skilled trades or careers in science and technology.

FACT: Vocational high schools offer their students the best possible preparation for these jobs by combining the kind of academic learning and occupational training that employers are looking for.

FACT: Vocational technical students graduate from high school with the right training to move into the well-paying jobs or to continue their education in technical school or college.

VOCATIONAL TRAINING IS FOR EVERYONE. . .

We may have our own ideas about what makes a good welder, drafter, electronics technician or health assistant. These jobs require special skills and hours of training.

The fact is, ALL kinds of people can, and do, work in these jobs. Women, men, Blacks, Hispanics, people who are handicapped or who have limited English speaking ability can be trained for these successful and satisfying careers. And a vocational technical high school can be the first step to getting the kind of training that is needed.

Want to find out more about the many opportunities that a vocational education can offer your son or daughter? Then contact your child's guidance counselor or call your local vocational high school today.

Choose a vocational technical high school and help your teenager get a better start on tomorrow. Vocational schools provide:

- Training on up-to-date equipment in a wide range of occupations.
- Certified instructors who stress practical knowledge as well as theory; teachers who have actually worked in the jobs that they will be teaching your children.
- New and different learning experiences that combine academic courses with "hands on" training in the shops.
- Co-op work experiences that give students a taste of what it is like to actually work on a job site.
- Full academic programs and the chance to pursue advanced education and training after high school.
- Extra curricular activities like sports, student government, student organizations and dances.
- Discipline, responsibility and increased self-esteem.
- Placement services to help graduates find jobs.
- Increased opportunities for the future.

Academic Program

You will take academic courses matched to your ability and career interests: English, Mathematics, Sciences, Social Studies, Related Theory, and others are required. You will apply what you learn in shops and laboratories equipped with modern, up-to-date equipment. You will learn to work with a variety of people on group and individual projects.

Depending upon your talents and personal interests, you will find your academic schedule prepares you for running your own business, being an independent entrepreneur, continuing on to higher education, or becoming an important manager in a technical company.

As a ninth grader, you will be expected to select a full schedule of academic courses. During academic week, you will take English, Mathematics, U.S. History, Related Technology, Physical Education, and Introductory Physical Science. These courses are designed to be challenging and enable you to start to reach your maximum level of potential.

Pathfinder is a clean, modern facility operated in a humane but business-like manner to prepare students to meet the requirements of higher education, business, or industry. An attitude of mutual respect prevails among students, administrators, faculty, and staff.

SOURCE: "You Can Do It! Vocational Education--A Student-Parent Fact Pack on Vocational Education Opportunities in Massachusetts."

IX. ACADEMIC SKILLS

Model A Joint Academic Vocational Approach (JAVA); State of Kentucky

Description

Kentucky is another state where vocational educators are being proactive in their approach to the improvement of basic skills. To counteract a high adult illiteracy rate, Kentucky teachers are required to teach certain essential basic skills in each grade--and in each curriculum area at each grade level. In fact, a State Board of Education Regulation requires that 60 percent of a secondary student's time be devoted to basic skill development.

This commitment is reflected in the annual Kentucky Program of Studies. Under each vocational area are listed the courses offered in that area. Those vocational courses that will develop competencies in basic skills, equating to the additional unit needed to fulfill the 60 percent requirement, are marked with an asterisk.

The expansion of the introduction, practice, and reinforcement of basic skills in vocational education is also listed as a goal for planning programs for fiscal year 1986. Under this goal are listed the following objectives:

- Identify basic skills that can be reinforced and practiced in 30 vocational programs
- Develop at least two alternative implementation plans for integrating basic skills in vocational programs
- Develop a plan that allows more secondary students to achieve a vocational objective while pursuing academic requirements
- Implement a state school vocational guidance assessment plan for program placement and basic skills improvement
- Identify the skills to be taught by technical related programs in state vocational technical schools and provide the necessary instructional support

That Kentucky is also committed to competency-based education (CBE) has helped them in their basic skills reinforcement efforts. They don't just insert basic skills into the curriculum arbitrarily. Given **occupational** competencies for a given program or area, they are working to identify the basic skills involved in or underlying those competencies. Through the competency-based guides (for teachers or students) that are then produced, the basic skills can be infused into the curriculum where appropriate.

The Joint Academic Vocational Approach (JAVA) is a competency-based curriculum plan, initiated by the Kentucky Department of Education with some Chapter 1 and Vocational Education funding. Local districts shared in the development and paid participating teachers for some summer employment.

The program centers around a set of competency-based instructional materials that blend skills in the following prevocational and academic areas:

Prevocational	Academic
Agribusiness	Citizenship
Auto Body	English
Auto/Diesel Mechanics	Mathematics
Business and Office	Science
Carpentry	
Computer Awareness	
Drafting	
Electricity/Electronics	
Health Services	
Home Economics	
Machinist	
Marketing/Distribution	
Mining	
Welding	

With JAVA, academic skills have been cross-referenced to related tasks in prevocational programs. The skills for the prevocational areas were selected from task analyses and competency lists according to three criteria--that they (1) be exploratory (apply to as many jobs in the occupational area as possible), (2) have general educational value, and (3) represent actual job tasks (not made-up tasks for the classroom). Related academic skills were identified, and task assignment sheets were developed for use by teachers and students in both the academic and prevocational areas.

Committees of academic and vocational teachers at each site took part in the development process. They worked approximately three months in the summer, during which time they participated in staff development activities and completed such tasks as analysis of competency lists, identification of skills, and development of materials. In addition to the task assignment sheets, the materials include matrices of vocational-academic skills, bibliographies, vocabulary lists, and lists of resources required for the assignment sheets.

Students who participate in JAVA are ninth- and tenth-grade vocational students in urban and rural schools. Materials are also available for eleventh and twelfth graders. The materials are available statewide. In rural areas, the program has been found to be most effective where the vocational school is close to the home school (otherwise so much time for transportation is taken from the program that it is difficult to implement the program fully).

The program has been field tested in three different sites with students in grades 9 through 12 and achieved very positive results. Administrative support has been found to be a key factor in successful implementation of the program in local districts. Where administrators actively promoted the program, fostered success by choosing teachers they knew would cooperate, and followed up during the implementation process, the program was more highly successful.

For More Information

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X. ACADEMIC SKILLS

Model Dauphin County Area Vocational Technical School, Harrisburg, Pennsylvania

Description

Dauphin County Area Vocational Technical School offers academic and vocational education, adult programs, and customized job training. Both full- and part-time programs are available. Area schools give their own diplomas.

The school is in the fourth year (1985-86) of planning and implementing an educational model built around clusters. They started by grouping vocational courses according to the Dictionary of Occupational Titles (DOT) and came up with four major clusters: service, manufacturing, construction, and communication/transportation.

Departments were subsequently abolished, and clusters became the functional organizational units. Each cluster was headed up by a cluster manager, and each included an academic team (English, math, social studies, and science).

They hold free elections for cluster managers. Cluster managers serve for three years and receive $1,200 extra per year for serving in that role. There were some teacher complaints about the three-year term, but the costs of training the managers are high enough and the experience valuable enough that annual elections are not practical. Two academic and two vocational teachers were the first to be elected, so there was a good balance.

Each cluster develops its own curriculum, both academic and vocational, and vocational education dollars are being used to support the effort. The school feels that learning activity packages (LAPs) work best and that they are used most when teachers develop their own. Teachers, particularly the English and social studies teachers, wanted to start with a clean slate.

Some academic teachers had trouble adjusting to the integrated cluster approach. Social studies teachers, for example, initially had difficulty identifying how their content could be occupational-specific. Now when they teach, they can, for example, include information about the labor movement and the industrial revolution.

Some vocational teachers also had adjustment problems. They felt a need--a strong need--to have the time to teach students everything they will ever need to know occupationally. The administration, on the other hand, senses that when vocational teachers **think** they are producing students who are prepared totally and for all time, they do students a disservice. Such students tend to think they know it all and are not amenable to instruction and training on the job.

In the development of clusters and curriculum, they had input from business and industry every step of the way. They took every new idea to the occupational advisory committees for approval. And all curriculum, including academic curriculum, must be approved by the advisory committees. The administration feels very strongly that the advisory committees must be consulted and **listened to**, or they won't be around very long.

New teachers are oriented to the cluster approach through the inservice training program offered as part of their induction program. In addition, all teachers come together for meetings; according to the administration, simple proximity does have benefits. However, there are problems in finding ample time for vocational/academic sharing and curriculum development. As part of the union contract, only 10 hours of inservice time are allocated per year.

An example of how academic/vocational instructors in a cluster cooperate at present is as follows. When students are given a technical writing assignment, both the English teacher and the shop teacher are involved. The English teacher helps the shop teacher select the writing format most appropriate to the specified occupational content, and the shop teacher provides the English teacher with a list of technical terms that would be used. Students receive the writing instruction they need in English class and the occupational knowledge they need in related instruction class. The completed reports are then graded by both teachers; the English teacher grades the writing skill, and the shop teacher grades the occupational content.

To measure student progress through the academic program, they administer both math and English pre- and posttests. This is critical in Pennsylvania, which has mandated minimum competency levels in basic skills. Thus far, math scores are improving, but English scores are not. Pennsylvania plans to establish common-core competencies; each cluster will then add area-specific competencies.

Pennsylvania also requires two humanities credits for graduation. In the case of science credit, vocational students can earn credit at the tech school for successfully completing the Principles of Technology course. Legislation is pending to provide a similar provision for humanities credits.

Perhaps one clear measure of the success of the Dauphin County AVTS program can be shown through the results of the Educational Quality Assessment Test, which is administered to students in Pennsylvania three times during their schooling. Students from Dauphin County AVTS are now in the 99th percentile. Furthermore, as the program progresses, Dauphin is finding that the teachers are becoming more and more enthusiastic about the clustering concept.

For More Information

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XI. ACADEMIC SKILLS

Model Program Options; State of Ohio

Description

In 1983, Ohio approved nine deliberately unconventional pilot projects at the local education agency level. Schools approved for pilot efforts agreed that their projects would (1) be occupationally specific in instructional content and design and (2) include a nonlaboratory instructional component designed to do the following:

- Reinforce basic skill competencies
- Support the overall occupational and employability needs of students in a changing work world
- Establish a foundation for training and retraining throughout a student's working lifetime, particularly in the areas of math, science, and/or communications
- Complement recently modified state high school standards
- Enhance crossover opportunities for college-bound students
- Be cost-effective

Based on the pilot efforts, a model was developed in 1985 for the integration of academic and vocational education: Program Options. One other basis for the model was the new statement of goals for vocational education in Ohio, which had been devised following an analysis of the recommendations and provisions contained in The Unfinished Agenda (The National Commission on Secondary Vocational Education), Keeping Vocational Education at Work (Blue Ribbon Committee on Secondary Vocational Education in Ohio), and Master Plan for Excellence (Ohio's State Board of Education). According to this statement, by 1990 the secondary vocational education programs in Ohio will do the following:

- Reach 50 percent of the high school population in job training programs
- Prepare students to secure gainful employment or pursue postsecondary education in the field of training at a rate that will exceed the general youth employment rate by at least 10 percent
- Prepare students in math, science, and communication skills appropriate for entry-level positions and provide the foundation for postsecondary education
- Enable vocational students to demonstrate (1) occupational competencies at a level of proficiency acceptable to the employment market; (2) the ability to adapt and advance in an ever-changing work environment; and (3) employability skills, including positive work ethics, attitude, self-concept, and management of work and family responsibilities

The model, as the name options implies, really offers a selection of models: Types 00, 01, 02, 0X, 0Y, and 0Z. In each model, a vocational teacher is responsible for teaching an uninterrupted **minimum** of 150 minutes of vocational education instruction daily. Types 00, 01, and 02 cover vocational content

only; Types 0X, 0Y, and 0Z are correlated vocational-education/applied-academic-instruction models. Beyond that, there are variations.

Type 02 is a vocational block, including in the 150 minutes both lab skill development and in-school technical related instruction, both taught by the same instructor. Technical related instruction must be equivalent to a minimum of 20 percent of the weekly vocational time allotment. Vocational education funding for this type is .67 unit; and only vocational education credit is granted.

Types 00 and 01 each offer a 150-minute vocational lab taught by one instructor and a separate technical related instruction class taught by another instructor. Type 01 includes a 40-minute related instruction class; vocational education funding for this type (a total of a minimum of 190 minutes daily) is .83 unit. Type 00 includes 80 minutes of related instruction; vocational education funding for this type (a total of a minimum of 230 minutes daily) is 1.00 unit. Only vocational education credit is granted for Types 00 and 01.

Types 0X and 0Z start with a vocational block (as described for Type 02). Added to that block is daily instruction in applied academics, taught by a certified academic teacher (who could be vocational teacher with dual certification). Type 0Z includes a minimum of 40 minutes of daily academic instruction correlated with the vocational instruction; vocational education funding for this type (a total of a minimum of 190 minutes daily) is .83 unit. Type 0X includes a minimum of 80 minutes of daily academic instruction correlated with the vocational instruction; vocational education funding for this type (a total of a minimum of 230 minutes daily) is 1.00 unit. Both academic and vocational education credit are granted for Types 0X and 0Z.

Type 0Y starts with a configuration similar to that of Type 01 (a minimum of 150 minutes of lab and 40 minutes of technical related instruction daily), but both taught by the same instructor. Then two additional academic options are possible; in each case, a minimum of 230 minutes daily are involved, and vocational education funding is 1.00 unit.

In one Type 0Y configuration, a certified academic teacher teaches a minimum of 40 minutes of applied academics daily, worth one unit of academic credit per year. In the other configuration, a certified academic teacher teaches applied academics twice a week one semester and three times a week the other semester, worth one-half unit of academic credit per year. In this latter configuration, the two or three 40-minute periods that remain are used by the vocational instructor for technical related instruction.

Although these descriptions indicate minimum instructional time, the state of Ohio encourages school districts to expand instructional time.

The Program Options model includes some additional requirements for the correlated vocational/academic programs:

- Academic instruction shall be limited to applied math, science, and communications derived from specific vocational education taxonomy courses of study.

- All vocational education and academic teachers will be properly certified in their respective areas.
- Only job training vocational education students are to be enrolled in the correlated academic classes.
- Applied vocational academic classes are to be locally designed for a specific taxonomy. Clustering of vocational education programs within one or more academic classes is permissible when there is a common core of math, science, or communication concepts. Maximum class size in either case will be 25.
- All vocational education and academic teachers must attend a state-sponsored preservice workshop related to the correlation of academic and vocational education instruction.
- Prior to unit approval, a correlated academic and vocational education course of study must be approved by the Divisions of Vocational Education and Elementary and Secondary Education to assure granting of credit.
- Regularly scheduled and unobligated correlation time, either on a daily or weekly basis, must be provided for vocational education teachers to plan and correlate with the appropriate academic teacher(s).
- These options do not apply to co-op programs.

Once the model was developed and approved by the state superintendent and others, state staff took very specific steps to secure ever-widening awareness of and support for the new options. Their careful use of the change process and their provision for local prerogative are probably two key reasons for their ultimate success.

First, they presented the approved model to the field (e.g., local superintendents and directors) for discussion. Based on that discussion, they finalized the model and developed an implementation process. Then they started providing inservice sessions, first to orient the state division staff, and next to orient local vocational directors/supervisors. At that point, the local schools made their decisions concerning whether to get involved and, if the decision was positive, they submitted letters of intent to participate. In-service sessions were then held to orient participating vocational and academic staff. These sessions were held in June, which allowed those staff members with extended-service-time several months to develop a course of study for implementation in the fall.

Notice that, on the one hand, state staff had worked to secure the support of each higher level of staff before moving to the next level. Thus, when they got to the teachers, they had in hand support from the key state, district, and school leaders. On the other hand, they focused on support, not mandate. Each group had "their day in the sun," during which their concerns were addressed, their questions answered, their opinions sought. And the decision to participate was, finally, a local one.

In a summary of the status of Program Options for 1985-86, the following findings were among those presented. Of the 32 school districts in Ohio that were funded to develop Program Options, 24 had initiated Program Options to some degree, and 6 were in the planning stages for initiating such programs in 1986-87. The vocational programs with the greater number of applied academics are

auto mechanics, welding, drafting, carpentry, machine shop, data processing, horticulture, child care, and food service. The greatest number of applied academic courses is in math (173 offerings). There are 67 communications offerings, 27 Principles of Technology classes, and 24 applied science offerings. The applied academic classes are being taught by 34 math teachers, 30 communication teachers, and 12 science and/or physics teachers, all certified. Most districts do no (or very limited) clustering of vocational classes to provide the applied academics.

The reports provided concerning Program Options indicate that the state staff are pleased with both the potential and the results thus far. In the document presenting the Program Options proposal, it says--

> Program Options affords students greater flexibility in meeting academic and vocational requirements, as well as provides them with the academic foundation for lifelong learning, upward employment mobility, or occupational transitioning due to changing career patterns or job dislocation.

In another report prepared by state staff, early results from pilot efforts were reported that were extremely positive. At Wayne County JVS, junior food service students showed an average 93 percent improvement in math test scores from pretest to posttest. And at Alliance City High School, an applied academic teacher, comparing his vocational students with students in the academic track, marvelled at the enthusiasm of the vocational students in the pilot; school staff and visitors were equally impressed. With these kinds of initial results--improved test scores and increased student and teacher motivation, it is no wonder that the state of Ohio has great hopes for Program Options.

Two specific correlated vocational/academic programs in Ohio are described in detail following this model.

For More Information

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XII. ACADEMIC SKILLS

Model Ohio Program Options; Great Oaks Joint Vocational School District, Cincinnati, Ohio

Description

Great Oaks Joint Vocational School District includes four campuses, serving 35 affiliate schools. Secondary (11th and 12th grade), postsecondary, and adult courses are offered. In addition to their present focus on integrating applied academics into the vocational curriculum, they are also implementing a six-hour-and-fifteen-minute school day, with students' school attendance simulating work attendance. If a student misses a day, it's a zero and must be made up; there are no excused/ unexcused absences. Students are evaluated on written assignments/tests; skill performance; and participation, including cooperation, attitude, attendance, and conduct (10% of daily grade). New courses are being implemented in employability (e.g., interpersonal relations, problem solving, leadership, teamwork) and entrepreneurship. Sample 10 shows typical junior and senior daily schedules.

In 1979, Great Oaks funded a massive employer study, conducted by an independent research firm, asking employers 50 questions about their perceptions of vocational education and its graduates. The results showed that employers wanted to hire graduates who were (1) more flexible, (2) more capable of making lateral career changes, and (3) more capable of moving up the career ladder. They also wanted entry-level employees with better skills in math, writing, and learning how to learn.

In 1980, Great Oaks began working with local business and industry to reevaluate the competencies required for individuals to succeed within an occupation in a changing economy. After a two-year review process, the consensus reached by business and industry was that the skills in math, communications, and organization needed to be strengthened within each occupational area to permit upward mobility in the economic structure. It was also agreed that these skills needed to be taught by subject matter specialists and to be integrated and correlated with the occupational field of study.

Accordingly, Great Oaks initiated a limited experimental program in one center in 1982, involving five vocational programs that required varying levels of math and science: chef training, dental assistant, electronics, industrial maintenance, and welding. The ten teachers involved were selected because of their teaching skill, their openness to change, and their stick-to-itiveness. With the success of the experimental effort, the program was implemented in the 1983-84 school year and has since been accepted by the state department of education as a model for other Ohio schools to adopt. Let's look at the program and the processes.

Program structure. The Great Oaks program uses a Type OX option: an applications lab and two applied academics classes, an English class, and a class in employability skills/entrepreneurship per day. During the experimental and pilot stages, the lab was three hours and the classes were 50 minutes. At present, a variety of scheduling options is offered. In all cases, the applications lab is taught by a vocational instructor, and each academic class is taught by a teacher certified in that area.

In the junior year, students take the applications lab (occupational and technical data), employability skills/entrepreneurship, applied math, applied science (Principles of Technology or biological and chemical science), and English. In the senior year, students take the applications lab, employability skills/entrepreneurship, applied math or science, occupational-related communication and organizational skills, and social studies.

If you look at the schedule in sample 10, you will see that the occupational and applied academics classes are all named to emphasize that they are part of a total integrated **vocational** program: Integrated Occupational Applications Laboratory and Integrated Technical Foundations. Great Oaks feels that in order to have a total integrated program, learners need to know that they **must** pass all these courses to earn a vocational certificate; learners must be **sold** on the total package.

Change process. As with the overall state effort relative to Program Options, the process used by Great Oaks made full use of the change process--securing support from each level, involving all those affected in substantive ways, and providing the time and support needed for change. They also used marketing strategies to sell the program; having an associate superintendent with a marketing and distribution background probably helped in that regard.

At the outset, when the program was merely an idea conceived by the superintendent and associate superintendent, they took it to the state department and secured state input and support--support that is needed in order to maintain funding levels. Next, they went to the board of education, to their Council on Vocational Education (24 chief executive officers [CEOs] from business and industry), and to the local superintendents; and they sold the idea. Working then with planning committees, they developed a pilot approach.

Prior to announcements of the implementation of the pilot effort, they had several meetings with staff about it. They worked with staff who would be involved to explain how the proposed program would affect them, and they worked with principals and counselors in the affiliate schools to coordinate efforts.

During the process of making people aware, they didn't just use a telling mode. District staff were encouraged to offer suggestions, air grievances, and raise questions. And once the program was underway, they didn't stop their communication efforts. Twice a year, they met with affiliate school principals and counselors to keep them apprised of how the effort was progressing. They worked closely with the members of the Council on Vocational Education to secure their input and involvement throughout the changeover. As the implementation effort expanded, they went back to the original pilot-program people continually.

In addition, because change is a process and not an event, they are allowing each **campus** a six-year transition period in which to develop and implement the program. Each individual **vocational program** has two years to implement the program. This allows time for staff to accept the change, develop curriculum, work out kinks, and incorporate revisions. Since the integrated program reduces the vocational applications lab instruction time (formerly 4 1/2 hours), it also provides time for "redundant" instructors to consider their options.

In other words, under the old system there were, for example, 12 vocational instructors and 2 academic instructors (English and social studies) for every 6

programs. Under the new system, there are 6 vocational instructors, 6 applied academic and academic instructors (e.g., math, science, technical writing, English, and social studies), and 1 instructional coordinator for every 6 programs. To make the transition by simply dropping vocational staff could have created an irreparable morale problem. Instead, "redundant" staff have six years in which to retire; to find other employment; to move to adult education; or with help from a tuition reimbursement program, to obtain academic certification and "convert" to one of the applied academic or coordination positions.

Curriculum development process. Great Oaks has identified both common core basic skills competencies across occupations and competencies specifically applicable to one program or cluster of programs. When they were developing their Program Options model, they started with an available occupational analysis and used an advisory committee to help modify the task list for local conditions. Then academic and vocational teachers worked together to complete a three-step process:

- Task analysis
- Identification of objectives
- Identification of competencies needed to meet the objectives

The whole process is now tied in to the normal four-year curriculum review cycle, which they combined with their inservice program for Program Options. The subsequent curriculum review and reorganization effort takes five to six months. Involving instructors in the process gets them in the mode for change, and then when the actual change takes place, they are ready for it.

An example of how the process works is as follows. In the summer of 1983, vocational instructors and their supervisors met for 15 days to begin the curriculum review process. After an initial orientation, they reviewed existing courses of study to determine the content to be covered in each of the two years of the program. Then they sequenced the content into duty blocks and task areas, and they identified overall objectives and competencies for each block. The last task was the most challenging: identifying the math and science skills for each duty block. Not being fully versed in math and science theory, the vocational instructors sometimes struggled with terminology, concepts, and structure.

Once the vocational instructors had done their part, math and science specialists analyzed the identified math and science skills. They, too, formed the skills into duty blocks and task areas, with objectives and competencies. And then they sequenced the math/science duty blocks and tasks to correlate with those in the vocational course of study. Thus, the vocational curriculum determines the specific math and science concepts to be taught.

Next, time was provided for the vocational instructors and academic instructors to work together to design strategies and develop projects integrating math/science concepts into technical application. Decisions were made, sometimes with difficulty, about who would teach what part, what materials would be used, and what instructional methods would be used. During the pilot effort, all vocational and academic instructors were put together in one large planning area, which proved to be beneficial in developing team spirit. In subsequent implementation efforts, however, this has not always been possible because of space limitations. Instead they work in small groups, using existing facilities.

This teaming--from planning through implementation--is felt to be essential to the integrated effort. For one thing, it is impossible for two or three teachers to correlate their instruction on a continuing basis if they never communicate. More important, perhaps, is that students are more sold on the idea that the subjects are interrelated when they see their instructors working as a team. In fact, both experimental and control groups involved in the pilot effort showed that as soon as students don't see the relationship between math, science, and their vocational training, they draw back from learning math and science.

Time for teaming--for building rapport--thus does not end when the planning phase is over. During the pilot, for example, vocational and academic teachers were required to meet for 10 minutes a day--to touch bases, to compare progress, to communicate. After three to four months, the teachers made daily contact voluntarily, without being required to do so. Teachers also work as teams on curricular materials development.

Another way in which teaming is encouraged is that vocational instructors, to keep technically up-to-date, are required to make two industry visits per quarter. Now, the vocational instructors are encouraged to take the applied academic instructors with them on the visits. This not only promotes the team spirit, but it also helps eliminate one of the perceived weaknesses in the program: that academic instructors lack the on-the-job technical experience needed to come up with occupational applications easily. The vocational instructor can help the academic teacher in this regard, but more is needed. In the future, Great Oaks hopes to offer an option whereby applied academic teachers can, like their vocational counterparts, enter industry every four years to participate in a 40-hour work week.

Program delivery. The average class size is 18 students. Prior to entering the program, students are visited and also take a series of pretests to establish competency profiles. Math **skills** are tested using the McGraw-Hill/ CTB math test; typically only 19 percent pass. Thus, remedial math has to be offered as part of the related instruction. English and science **levels** are determined using the Stanford Diagnostic Test of Basic Skills, but knowing norm-referenced levels does not provide the specific diagnostic information needed.

Thus, to support students who desire or need growth in math, science, writing, and reading, the district is establishing a computer-aided-instruction (CAI) program that is competency-based. An individualized educational plan will be developed for each secondary (youth and adult) participant, with a series of evaluation checkpoints built into each plan. The district is also using the Academic Instructional Measurement Systems (AIMS) as a database in the development of criterion-referenced tests for math, English, and writing classes. Future plans call for the development of a CAI program covering occupational content.

When students enter the vocational programs from their home schools, 30 to 35 percent of them have basic skills proficiencies. The Great Oaks District is working, on the one hand, to ensure that students reach their junior year better prepared. On the other hand, they are working to provide all students, regardless of basic skills levels, with the instruction needed to become competent. It is therefore crucial that the curriculum be somewhat individualized. For this reason, academic and vocational teachers are being given time to work together (e.g., 3-5 weeks during the summer and/or 2 hours a day during the

school year) to develop learning activity guides (LAGs), teacher activity guides (TAGs), job task sheets, procedure sheets, information sheets, and the like.

There is another reason for supporting the development of LAGs and TAGs. When the vocational instructors lost instructional time (e.g., from 4 1/2 to 3 hours), there was a certain amount of panic. Granted, they no longer had to use their time to teach applied math and science, but they still felt they wouldn't have time to cover the vocational content. One response to this was to involve the advisory committee in reviewing the competencies to be included in the program, thus ensuring that the course content was pared to the essentials. Another response was to use different materials and strategies to deliver the content more efficiently.

Not only do teachers prepare new materials, students are now required to do more individual work outside class (e.g., readings, homework) and to prepare job plan sheets, which give directions for doing a series of operations or procedures involved in a complete job. In short, students are asked to take more responsibility for their own learning. Though students didn't automatically enjoy this "benefit" and though teachers found the curriculum development work strenuous, time is convincing both groups that the effort is worthwhile. In fact, when asked to list the advantages of the integrated approach, staff identified, among others, the following advantages:

- Student materials are better organized and of a higher quality.
- There is greater continuity in the curriculum.
- Students are able to progress at a more rapid pace.
- Through use of the sheets, students are better prepared in class to complete a job or operation.
- Students have learned to apply a logical, step-by-step procedure in completing a task and solving a problem.

In terms of the integrated curriculum, numerous benefits were listed and verified by the experimental data. Teachers say that working together makes for a more meaningful day and that the students benefit from having access to several experts rather than just one. Students in the experimental groups scored higher on achievement tests and technical performance tests than did students in the control group. They were also more highly motivated and had lower rates of absenteeism.

In the words of the associate superintendent, Cliff Migal, "The future looks bright. Being able to provide meaningful and concrete opportunities to relate math and science concepts and principles to the operations in the occupational field will certainly produce an individual who is better prepared to enter and advance in the labor market. The model in its present design permits the vocational competencies to be maintained at a high-quality level, while increasing the competencies in math, science, and communication skills."

For More Information

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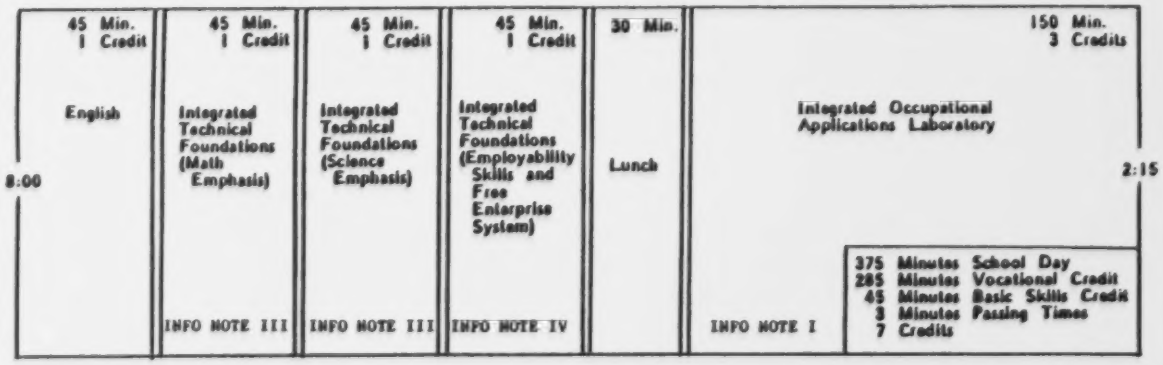
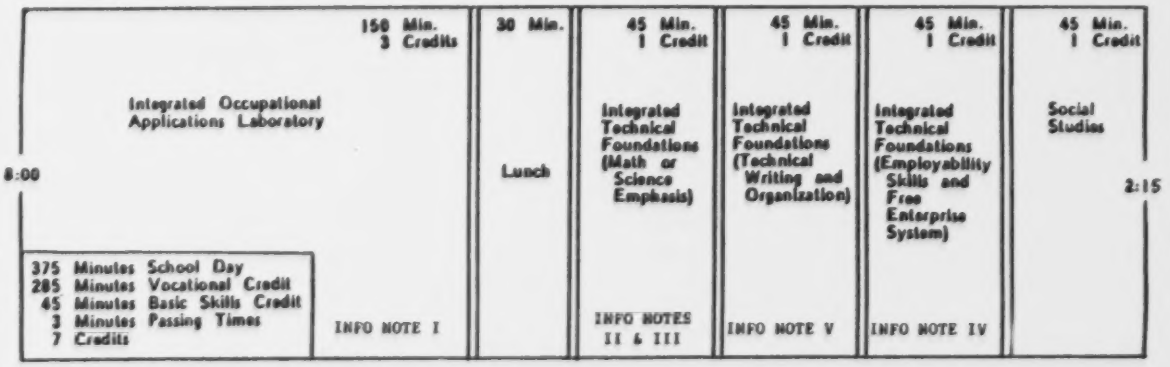
SAMPLE 10

PROPOSED STUDENT SCHEDULE

RECOMMENDED TYPICAL JUNIOR SCHEDULE – TYPE 00A



RECOMMENDED TYPICAL SENIOR SCHEDULE – TYPE 00A



XIII. MATH SKILLS

Model Ohio Program Options; Montgomery County Joint Vocational School, Clayton, Ohio

Description

At Montgomery County Joint Vocational School (JVS), a one-year applied math/autobody course of study was developed (6/85), approved by the local board of education (9/85), and sent for approval to the state's Division of Elementary and Secondary Education. From this course of study, a curriculum guide for one month's instruction was next prepared (1/86) and sent to the state for approval; JVS staff them had until the end of the school year to complete the entire guide.

The course of study includes the following:

- Statement of board approval
- Introduction
- District philosophy
- District basic philosophical tenets
- District philosophical goals for individual development
- District educational process for goal achievement
- Mathematics program philosophy
- Program goals for applied math/autobody
- Program objectives for applied math/autobody
- Scope and sequence for applied math/autobody
- Pupil evaluation policy

The program philosophy and goals are shown in sample 11. An excerpt from the applied math/autobody correlation chart, developed by the vocational and academic instructors for the one-month curriculum guide, is shown in sample 12. In planning the lessons and the method of presentation, the academic/vocational team then selected activities that were concrete in nature--using manipulatives, job-oriented examples, and direct applications to the trade. Applying the skills as soon as possible in problem-solving situations directly related to the job is highly advocated.

For More Information

Shari Wolf, Mathematics Mentor; Montgomery County Joint Vocational School; Clayton, OH 45315; (513) 837-7781

SAMPLE 11

APPLIED MATH/AUTOBODY PHILOSOPHY & GOALS

Philosophy

Mathematics is the universal language developed by human beings as a tool to communicate quantitative and spatial ideas.

Today's society requires citizens to use mathematical skills on a daily basis for personal and/or vocational purposes. While variations in student ability exist, all students can learn mathematics. The purpose of this program is to provide students with an opportunity to gain adequate knowledge of mathematics in order to become a functioning member of a rapidly changing society.

Proficiency in fundamental arithmetical skills and understanding of mathematical concepts and their practical applications represent skills that students need in order to function in our society. As the needs of society change, proficiency in algebra, trigonometry, logic, and problem solving will be needed. The need to develop these competencies requires a structured program that presents the skills, concepts, and applications in an appropriate scope and logical sequence.

Maintaining a sequence is essential in the development of mathematical skills. Instruction should follow the sequence, ensuring proficiency at each level, in order to assure successful learning. Conceptual development is enhanced when teaching strategies proceed from the concrete to the abstract. All areas of mathematics are more easily grasped when applications are made to the vocational trade and to practical daily experiences.

The goals in this program include more than computation. Besides the opportunity to use such skills as estimating, problem solving, measuring, and organizing information in applying mathematics to vocational situations, students will also have the opportunity to develop more advanced mathematical skills, such as algebra, trigonometry, and geometry.

Goals

I. The student will be able to apply the four basic operations--addition, subtraction, multiplication, and division--to whole numbers, decimals, fractions, and percents.

II. The student will be able to apply measuring skills to obtain the data necessary to solve problems relevant to autobody.

III. The student will be able to apply mathematical concepts and operations to solve problems relevant to autobody, check the reasonableness of the solution, and interpret the results in terms of the original solution.

IV. The student will be able to read and interpret charts, graphs, tables, and handbooks.

V. The student will be able to use calculators and computers when appropriate.

SAMPLE 12

CORRELATION CHART EXCERPT: APPLIED MATH/AUTOBODY

Academic Goal I: The student will be able to apply the four basic operations--addition, subtraction, multiplication, and division--to whole numbers, decimals, fractions, and percents.

Academic Objectives	Vocational Activities
Whole numbers: Apply four basic operations	
Measurement using a ruler: Apply four basic operations	Analyze extent of damage to frames Operate damage dozier and attachment Repair and align a frame to manufacturer's specifications Replace the following: frame assembly, front frame section, frame horn or rear cross-member, rocker panel, front fender (bolted), cowel panel
Ruler fractions: Apply four basic operations Combine various operations	Determine direction of force or impact Determine hidden damage Rough out damaged panel Replace the following: front frame section, frame horn or rear cross-member, center pillar
Liquid measurement: Denominate numbers Simplify feet/inches Rename perimeter using diagrams Apply four basic operations Convert to simplest form	Mask operations Apply striping and decals Prepare for polyurethane enamel finishes Determine direction of force or impact Rough out damaged panel Use plastic-type fillers Form sheet-metal patches Replace outer door panel Make a fiberglass patch panel

NOTE: The academic objectives (listed in the left-hand column) are met with specific application to vocational content. The math instruction focuses on the applications of math in the world of work, and the examples given and the problems solved are drawn from the occupation.

XIV. MATH SKILLS

Model Automated Diagnostic Test and Data Base for Mathematics Skills in Vocational Education; Southeast Community College, Cumberland, Kentucky

Description

With funding from the Kentucky Department of Vocational Education, staff at Southeast Community College worked from July 1985 to June 1986 to meet the following objectives:

- To diagnose the math skills needed by students in selected postsecondary programs in Kentucky
- To code a computer program and build an automated database to accumulate and analyze data by specific reference groups
- To code a computer program that will test and statistically diagnose the math skills of a vocational student in a specific reference group

This project grew out of an awareness that, although mastery of fundamental math skills is necessary to successfully complete a postsecondary vocational education program of study in Kentucky, existing diagnostic instruments and remedial course work in the area of math were not relevant to vocational careers or students' individual needs. Historically, vocational students in Kentucky score low on college entrance math aptitude tests, but those scores offer little help in identifying relevant math strengths and weaknesses related to a student's occupational career choice. And without a relevant diagnosis, time was often wasted in remedial courses; students often spent too much time on skills they had already mastered and too little time on mastering skills in which they were deficient.

To eliminate these problems, staff at Southeast Community College have developed a Diagnostic Mathematics Skills Inventory programmed for the IBM-PC, with an accompanying test manual and instructions. This instrument is designed to diagnose the specific math skills of vocational community college students in the following domains: arithmetic, algebra, concepts and problem solving, and applications (see sample 13). Using this instrument, a student may individually diagnose his/her skills and then concentrate on skill deficiencies to ensure mastery and vocational success.

The inventory was developed using five reference groups: business management, medical laboratory technology, mining, nursing, and secretarial administration. A review of the literature for relevant math diagnostic tests was also conducted. A validation study was done using freshmen at Southeast Community College as subjects. Item analysis was also done, including computation of the difficulty index and item validity, and the correlation was determined for item reliability. Following revision, the instrument was again tested for reliability and validity with entering freshmen at Southeast Community College. Finally, the instrument was pilot tested with a stratified sample of all entering vocational community college students in Kentucky. An attitude survey--with affective, cognitive, and behavioral components--was included to determine

SAMPLE 13

MATHEMATICS SKILLS INVENTORY

1.0 Arithmetic Skills
- 1.1 Whole Numbers
- 1.2 Fractions
- 1.3 Decimals
- 1.4 Ratio
- 1.5 Percentage

2.0 Algebraic Skills
- 2.1 Signed Numbers
- 2.2 Algebraic Expressions
- 2.3 Exponents in Algebra
- 2.4 Proportions in Algebra
- 2.5 Number Sentences

3.0 Concepts and Problem Solving
- 3.1 Measurement
- 3.2 Number Types
- 3.3 Number Theories
- 3.4 Set Theory
- 3.5 Problem Solving

4.0 Applications
- 4.1 Metrics
- 4.2 Calculators
- 4.3 Computers
- 4.4 Plane Geometry
- 4.5 Solid Geometry

if a significant difference existed between math attitude and skill diagnosis. The instrument was administered in both paper-and-pencil (for optical scanning) and computer-based mode so individuals' performance using the two modes could be evaluated and compared.

Although the research was conducted using vocational community college students in Kentucky, the developers feel the final standardized test product will be applicable to both secondary and postsecondary students, and could be easily implemented into a vocational education curriculum anywhere in the world if desired.

For More Information

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XV. MATH SKILLS

Model An Integrated Vocational Education and Math Skills Model; Corvallis School District, Corvallis, Oregon

Description

Using a grant award from the Vocational Division of the Oregon Department of Education, mathematics and vocational teachers in the Corvallis School District have developed a process model for integrating vocational education and math skills. As a result of their efforts, Corvallis staff have successfully implemented an integrated approach within the high schools in the district. In addition, they have produced detailed guides--an implementation guide and an inservice guide--to assist others in integrating math and vocational education.

One impetus for the model-development project was the national focus on academic excellence, which resulted in increased requirements in mathematics and other academic (core) subjects, which, in turn, tended to reduce enrollments in elective courses, including vocational education classes. Yet evidence and experience suggested that this trend was not necessarily beneficial for all students. Although some students learn best in traditional classes through sequenced instruction in academic concepts, other students learn concepts more readily through applications within a subject of career interest. Thus, both options for the delivery of academic instruction should be available to students.

In order to retain a variety of program options and maintain a balanced curricula, staff at Corvallis sought to develop an approach for integrating math into vocational and technical courses, while ensuring that students would receive sufficient math in a sequence of vocational courses to justify the awarding of math credit. (Only one math credit of the four required for graduation may be earned this way.) Specifically, they pursued four objectives:

- To identify the specific mathematical concepts that are taught in the various vocational programs
- To define combinations of courses that offer sufficient applications to deserve math credit
- To define approaches to math that have the support of math and vocational instructors
- To establish criteria for granting credit for math received in a vocational class

The process model developed relies on three inservice workshops designed to help teachers plan for integration: orientation inservice, workshop for validating math in vocational programs, and professional development inservice.

<u>Orientation inservice</u>. In this initial three- to four-hour inservice workshop, math and vocational instructors meet together to be introduced (1) to the rationale/purpose for offering an integrated approach and (2) to the processes they are to follow in planning and implementing this approach. At this first meeting, math and vocational instructors are peer-paired to work as integrated

teams. Throughout the workshop the peer-pairs stay together and work together. Large-group presentations are made, and then the teachers meet in small groups to discuss the concepts presented. Each small group may be a peer-pair, or several peer-pairs representing a single vocational area may be grouped together. In this way, participants not only gain the information needed but also begin to work as integrated math/vocational teams.

Workshop for validating math in vocational programs. During this one-day work session, vocational instructors and their math counterparts work in small teams to complete the following tasks:

- Review existing curriculum guide for the vocational program to determine the degree to which math is now included in the written curriculum
- Identify specific math applications in each course
- Identify course sequences that offer justification for math equivalency credit
- Obtain approval from math instructors for the math equivalency credit

Analysis of the present curriculum can be structured using a matrix (see sample 14). Identification of specific math applications must be structured using a skills checklist, which breaks mathematics into its many concepts. The 134-item checklist used by Corvallis teachers was adapted from a checklist developed by the Oregon Math Educators Council (see sample 15).

Once these tasks have been completed, the instructors need to fill out a math equivalency credit application form, to which are attached the program curriculum (completed equivalency checklist), planned course statements, and course outlines. A review committee considers the application and makes the final approval decision. This committee consists of a district subject area curriculum specialist, building administrator, core teacher representative, elective program teacher, and curriculum coordinators.

Approval of math equivalency credit is determined on the basis of specific established criteria:

- The program is a district-approved two-year vocational program.
- The sequence of courses is clearly defined and has been approved by a team of math and vocational instructors.
- Math instruction is provided through a **series** of vocational courses approved for math credit.
- The curriculum includes math daily through (1) review or introduction of math skills or (2) use of math applications.
- Math concepts are clearly defined in writing. Of the 134 items on the math task checklist, 117 items must be taught in the vocational curriculum (i.e., must receive ratings of "2"--taught, but minimum depth and regularity; or "3"--taught, maximum depth); at least 40 of those 117 items must receive "3" ratings.
- Vocational staff have a strong commitment to teaching math as an integral part of their curriculum.

Professional development inservice. This is a four-hour sharing session during which each two-member math/vocational instructional team presents six math concepts they have selected, with each team member using his/her own approach. At the end of each team's 30-minute presentation, the large group is asked to spend 10 minutes discussing and critiquing the two approaches used (their effectiveness, similarities and differences between approaches, advantages and disadvantages). Through this sharing, instructors develop mutual respect, an improved spirit of cooperation, and a better understanding of theoretical math concepts and their vocational applications.

Process facilitators and benefits. One facilitator was that there was administrative support and commitment. Principals at both Corvallis high schools want to provide appropriate options for **all** students.

Second, academic/vocational involvement at all levels was provided. The project was co-directed by a career and vocational education curriculum coordinator and a mathematics curriculum specialist. Math instructors, vocational instructors, and guidance staff from both high schools participated in the project. The district committee included curriculum specialists, as well as the principal, a counselor, a math instructor, and a vocational instructor from each high school. And the project steering committee included two high school counselors, a district vocational advisory council member, and math and vocational educators from two-year colleges and a state university.

Third, the project's co-director is a member of the group that developed the math skills checklist. This helped to secure acceptance of the math teachers for the concept of integrating math and vocational courses. The checklist itself was a key facilitator in the project's effectiveness.

Fourth, documenting the process in detailed guides will allow staff to keep the project alive and well. The greatest barrier they had to overcome was staff turnover. In the middle of the project, four new vocational teachers and one new administrator came on board. With the guides, these new staff members could be quickly and efficiently acclimated to the integrated approach. As a result, they were very enthusiastic and, in fact, brought a fresh dimension to the group.

Finally, teachers, as well as students, benefitted from the integrated approach. Math teachers were actually in the vocational facility, some for the first time. And both math and vocational teachers shared approaches and styles of teaching.

For the future. Corvallis hopes to continue utilizing the peer-inservice model in other areas (e.g., English and Business Communications). They are also in the process of developing computer-assisted video instruction for basic math skills units. These "math vignettes" will be used in mechanics and business machines classes at both high schools. In addition, a final project report is being prepared, and this report, as well as the two guides, will be made available through the ERIC system.

For More Information

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MATRIX: MATH APPLICATIONS BY CONTENT UNITS

MATH TOPICS	CONTENT UNITS IN WHICH MATH TOPICS ARE COVERED			
	MECHANICS	CONSUMER HOMEMAKING	WOODS	ELECTRICITY/ELEC.
A. BASIC ARITHMETIC SKILLS				
1. WHOLE NUMBERS	Timing (also degrees) Grade averages Engine rebuilding	(F) Measurement tech. (C) Teaching math to children (L) Family budgets	Statements Board feet Cost est. Shop bill Work orders	See note. Examples: Ohm's Law, Watt's Law, Inductance, Capacitance
2. FRACTIONS	Cylinder displacement Place valve	(F/C) Understanding recipes (F/C) Increasing/Decreasing recipes (S) Amount of fabric	Measurements Dimensioning Proportions Building to scale	Parallel circuits
3. DECIMALS	Micrometer readings Brakes Displacements Tolerances	(F) Budgeting for foods (C) Spending budgeted allocations (L/S) Figuring costs of products/garments	Cost est. Shop bill Work orders Statements	Digital instrumentation
4. PERCENT	Ratio Coolant system	(L) Family budgeting (C) National, state, local data (F/L) Dietary requirements	Markup Cutting loss	Percentage of error Percent of amplification

NOTE: Applications in this area are found in all levels of the four-year sequence of electronics.

SAMPLE 15

MATH EQUIVALENCY CHECKLIST

* This checklist is provided for instructors to analyze their own curriculum in relation to the math applications being made in vocational courses.

* The instructor should write in the names of specific courses in the vertical blocks at the top of checklist. The names of programs can be shown in the horizontal block at the top of the checklist. Rate each item according to the scale shown under Math Topics.

MATH TOPICS 0 = Not applicable 1 = Applicable, but not being taught 2 = Taught, but minimum depth and regularity 3 = Taught, maximum depth	ACCOUNTING			OFFICE OCCUPATIONS				DRAFTING				
	ACCOUNTING I	ACCOUNTING II	ACCOUNTING III	BUSINESS MACHINES	ACCOUNTING (1 semester) or	RECORDKEEPING	OFFICE PROCEDURES	DRAFTING I	DRAFTING II	DRAFTING III	DRAFTING IV (CAD)	ARCHITECTURAL DRAFTING
* A. BASIC ARITHMETIC SKILLS												
*1. WHOLE NUMBERS												
* Add	3	3	3	3	3	3	3	3	3	3	3	3
* Subtract	3	3	3	3	3	3	3	3	3	3	3	3

XVI. SCIENCE CONCEPTS/MATH SKILLS

Model Principles of Technology, as applied at Detrick Vocational Center; Louisville, Kentucky

Description

Principles of Technology (PT). According to PT's developers, jobs and workers are increasingly affected by modern technology and challenged by the diversity, complexity, and rapid evolution of the equipment. Vocational-technical education must respond by preparing students with a broad base of technical concepts and principles, thus enabling future workers to be more employable and flexible in the changing job market and work force.

PT is one way in which vocational-technical educators can respond to this challenge. PT is a high school course in applied science that (1) helps prepare tomorrow's technicians, (2) teaches technical principles and concepts, (3) improves science and mathematics skills, and (4) provides hands-on laboratory experience.

The PT curriculum is for eleventh and twelfth graders interested in technical careers, who have completed satisfactorily one year of high school general math. The following broad-based physics concepts and principles relevant to the technological workplace are covered in 14 units (actually, 12 full units and 2 half units): force, work, rate, resistance, energy (half unit), power, force transformers, momentum (half unit), waves and vibrations, energy convertors, time constants, radiation, transducers, and optical systems. PT can satisfy one or two years of **science** requirement for high school graduation. In addition, students taking PT review and strengthen those **math** skills required for understanding and applying the technical concepts and principles.

PT can be taught by a vocational-technical teacher familiar with the physics and math covered in the materials, or by a science teacher, or by the two working together as a team. According to the developers, no teacher inservice activities are required to use the materials. (According to users at Detrick Vocational Center, PT teachers do, however, need plenty of preparation time the first year.)

The PT curriculum covers six full units and one half unit each year, and each full unit involves 26 fifty-minute classes. Thus, there are 169 fifty-minute classes per year required (6.5 x 26). A unit begins with a fifty-minute overview and ends with a fifty-minute summary. In between those two classes, the concept or principle is applied to four different systems (subunits): mechanical, fluid, electrical, and thermal. Each subunit involves 6 fifty-minute classes: two classes in which the application of the concept to the system is introduced and demonstrated, one math lab class, two concept lab classes in which the concept is applied, and one class in which the subunit is reviewed and the next subunit is previewed.

The PT materials for each unit include a teacher's guide, 6 videotapes, 50 pages of student text, 8 hands-on application labs, 4 classroom demonstrations, and 4 math practice labs. Whenever possible, concepts are related to technological devices in the context of the workplace. Devices represent a wide range of technical fields, and a wide range of technicians are shown applying

the concepts and principles. The language and reading level are appropriate for high school vocational-technical students. All materials are reviewed regularly in draft form by selected vocational-technical curriculum specialists and teachers, science and math educators, and industry representatives prior to use in the classroom.

A good deal of laboratory equipment is required to support the implementation of PT. For each unit, there is equipment for the lab and for each station in the lab. Arrangements have been made with the Sargent-Welch Scientific Company (35 Stern Avenue, Springfield, NJ 07081) to serve as supplier of this equipment.

The PT curriculum is being developed by a consortium of state and provincial vocational education agencies in association with the Agency for Instructional Technology (AIT) and the Center for Occupational Research and Development (CORD). Schools in all participating states and provinces are part of a two-year pilot test (September 1984 to June 1986) of the entire system of instruction.

Detrick Vocational Center, Jefferson County Public Schools. As part of the requirements for graduation, students in Jefferson County Schools must earn three credits in science. Previously, these science classes were offered in the high school and might--or might not--correlate directly with students' vocational studies. Presently, Detrick Vocational Center is offering two of the necessary science credits through a state-approved course called "Special Topics in Physical Science 2564," taught by two veteran science teachers with vocational backgrounds, using the PT curriculum.

As a result, science is highly correlated with each student's specific vocational subject. Because the science teachers have vocational backgrounds, that has helped them both to relate the science content to the occupational content and to develop extremely good working relationships with the vocational teachers. The science and vocational teachers share ideas and equipment and discuss the applied principles and competencies. Furthermore, one day a week is provided for the PT teachers to spend in the vocational shops with the students, applying the concepts learned in the PT lab. A bridge between academics and vocational education is thus created.

The PT program has other benefits for the students, beyond the correlation of course content. They can obtain part of the required science credits at the vocational center, while pursuing their vocational goals, thus allowing students more flexibility in their scheduling. And because PT is taught at the vocational center, it has also attracted students who normally do not take science classes, particularly female and minority students. Of the 110 students who took PT during the first year it was offered, 20 were females and 40 were minority students.

Academically disadvantaged students also benefit. Of the 110 PT students, 67 were considered academically disadvantaged. Furthermore, approximately 30 students with reading and math deficiencies attend Detrick's learning center one day per week to receive individualized instruction, and the PT teachers work very closely with the learning center teacher. Another bridge.

According to Detrick's principal, Robert L. Petry, the elements that most facilitated their efforts were as follows:

- Preorientation of the regular vocational teaching staff several months before the PT program started
- A good vocational teaching staff, which bought into the program
- Two very good science teachers and a learning center teacher, who formed a good teaching team with the other teachers
- Monies from the state, and local support from the Jefferson County Public Schools administrative staff, including the superintendent, chief deputy superintendent, assistant superintendent of vocational education, and science specialist
- A good laboratory facility, with plenty of space and storage
- A very supportive advisory committee

In the process of implementing the PT curriculum, staff at Detrick have discovered that it is important to remember that applied **concepts** must be taught, not simply use of tools and equipment. Furthermore, in motivating students to succeed in the PT program, it appears that the less PT seems like a **science** class, the more it appeals to students.

Plans for 1986-87 include continuing into the second year of the PT curriculum (Units 8-14), which will require funds for lab equipment and PT materials. Currently, the vocational center has lab equipment for 20 work stations, with two students per station, for PT Units 1-7. Lab equipment problems have been one of the greatest barriers to the implementation of the PT program at Detrick. Securing good-quality equipment from vendors at a reasonable cost has proved difficult.

In fact, some of the required equipment could have been developed, borrowed, or assembled in-house at considerable savings. Vocational programs, such as air conditioning, electronics, machine shop, and plumbing, could handle this task, given adequate time and money. Likewise, some of the apparatus could have been purchased more cheaply and easily at a local hardware store. However, if start-up time and available teacher time are in short supply, these cost-saving strategies may not be possible.

Detrick also plans to make PT a required course for certain vocational areas, such as transportation. This is based upon recommendations from their various advisory committees and vocational teachers. Doing so will permit the PT teachers to set up hands-on experiences for an entire class, right in the vocational shop, with the vocational teacher assisting. One recommendation for the future is that, when PT is a required course for a vocational area, the vocational teacher should accompany students to the PT class. This would provide for a smooth transition of concepts, help develop good teamwork and communication between teachers, and reinforce for students the need for the PT concepts.

Detrick has not yet settled on an optimum schedule for offering the PT program. At present, students are scheduled out of their regular vocational programs, which has constituted a barrier. A schedule permitting students to attend PT

classes fewer days but for longer sessions seems likely to suit their needs best at this point.

Also in the future, Detrick would like to have additional computers and software available for the enrichment of advanced students and the remediation of slower students, and to individualize each PT concept. They feel they may be able to accomplish this, at least in part, using data processing students who are enrolled in the PT program.

To guide future efforts, the PT program's first year at Detrick is being evaluated by faculty at the University of Louisville. The completed evaluation should be available in the fall of 1986.

That the Detrick Vocational Center feels strongly about the role of the PT program in the vocational center is evidenced by their promotional materials (see sample 16).

For More Information

Robert L. Petry, Principal; Detrick Vocational Center; 1900 South Seventh Street; Louisville, KY 40208; (502) 454-8237

SAMPLE 16

PROMOTING THE ROLE OF SCIENCE

DETRICK VOCATIONAL CENTER PROGRAM OFFERINGS

	COURSE NAME	COURSE NUMBER
1.	Air Conditioning, Heating & Refrigeration	TAO
2.	Auto Mechanics	TDO
3.	Auto Service Technology	TFO
4.	Boat & Cycle Mechanics	TGO
5.	Carpentry	TKO
6.	Cosmetology	TOO
7.	Data Processing	TPO
8.	Diesel Mechanics	TOO
9.	Horticulture	TYO
10.	Truck Mechanics	TUO
11.	Interior Finishing	TAA
12.	Masonry	TAD
13.	Office Machines	TAE
14.	Plumbing	TAG
15.	Welding	TAN

NEW SCIENCE COURSE —
COUNTS AS SCIENCE CREDIT

Principles of Science Technology

SPECIAL PROJECTS IN SCIENCE

PRINCIPLES OF TECHNOLOGY

A HIGH SCHOOL COURSE IN APPLIED SCIENCE THAT

helps prepare tomorrow's technicians

teaches technical principles and concepts

improves science and mathematics skills

provides hands-on laboratory experience

PRINCIPLES OF TECHNOLOGY involves the study of technical concepts underlying modern technology. Course involves a broad base of technical principles and associated mathematics. Studies of mechanical, fluid, electrical and thermal energy systems including force, work, rate resistance energy, power and force transformers are studied. Course is correlated with student's specific vocational subject. Students enrolled in this course will earn science credit.

NOW IS THE TIME!

VOCATIONAL EDUCATION

CAN HELP YOU

PLAN YOUR FUTURE

IT'S UP TO YOU

1900 South Seventh Street
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454-8237

XVII. SCIENCE CONCEPTS

Model A Process Model for Integrating Science Concepts and Vocational Skills; Sandy Union High School, Sandy, Oregon

Description

In the fall of 1984, Sandy Union High School implemented an integrated science/vocational program--the Environmental Science Program--which proved to be highly successful. Subsequently, with a Vocational Grant-in-Aid Contract from the Oregon Department of Education, Vocational Education Division, staff at Sandy High analyzed the method through which the science concepts and vocational skills had been combined and monitored and developed a detailed written process model, which can serve as a blueprint for other districts to follow. The process model includes the following elements.

First, make a commitment to involve both the people affected by the new program and those whose support is needed. This involvement should be continual throughout the planning, implementation, and evaluation process; and it should be real and substantive. Representative vocational and science teachers, administrators, students, parents, community members, and business and industry employers and employees should all have opportunity for appropriate levels of input and involvement.

Second, assess the current situation in relation to the proposed integrated program. At Sandy High, this assessment process involved a number of activities:

- Key staff (teachers most affected) were polled on the following questions: What science and vocational programs could be combined into a single, integrated program? How would a combined program be structured? How would teachers be selected? How would occupational roles and tasks be integrated? From this input, a preliminary tally was made of science and vocational offerings that had concepts and skills in common. Since Sandy High has access to a district-owned nature site (land laboratory), the most compatible vocational areas to ally with science were agriculture, forestry, and metals--an environmental science curriculum.
- Selected teachers from the science and vocational offerings identified were brought together and first led through a brainstorming session conducted by the district superintendent. Focusing on the question, What is taught in vocational education that is also taught in science? teachers suggested topics, which were placed on the chalkboard and discussed. After the topics had been identified, the superintendent selected one topic and led the team through the process of analyzing the topic according to the format shown in sample 17. Next, the teachers divided into groups of three to analyze, in writing, the remaining topics. And finally, the completed analyses--with coded identifier numbers--were compiled into a common curriculum based on the district's nature and priority vocational and science areas.

- A student questionnaire was circulated among the classes identified as components of the project. Students were asked their purpose in enrolling, what they hoped to learn, what qualities they possessed that would help them do well in the class, what occupation they intended to pursue, and how the class could help them meet their occupational goal. Based on the responses, about a dozen activities figured in the subsequent program writing more prominently than others.

Third, choose goals and objectives in the selected subjects and place them together with their companion student tasks. Restrict the major objectives to a manageable number, and base them on course goals the school already has in place (i.e., do not reinvent the wheel). Although the topics generated during brainstorming were general, the goals being identified at this point should be specific and limited.

At Sandy High, four applicable goals had already been established for a science class that would use the campus nature study site. Thus, these are the goals that were identified for further analysis.

Fourth, synchronize the goals and objectives. Review all the information you have gathered and all the relevant sources you have identified, and using a form such as the one shown in sample 18, put all the common pieces together into an integrated curriculum.

The grid in sample 18 can serve many functions. It allows you to identify, for each student project/goal, the course objectives, science concepts, related job titles, and student tasks (left-hand column). For each element listed in the left-hand column, you can then use the matrix on the right to identify the science and vocational classes that element relates to and the extent to which it relates: I = introduced; T = taught; and/or R = reinforced. This portrays, all on one page, how elements common to both sets of courses can be integrated. In the far-right column, you can list any topic analyses developed during brainstorming that relate to a given element.

Fifth, once the grids are completed for each goal and element, determine program length, needed materials, target population, and credit to be awarded. In Sandy High's case, two units of **elective** credit are awarded for successful completion of Environmental Science. These are counted toward the 24 units required for graduation. Most of the materials were already available through existing programs.

Finally, build program evaluation into the process from the very beginning. Include formative, summative, and third-party evaluation; and make sure that both sets of objectives--science concepts and vocational skills--are reviewed with equal intensity.

Throughout the program development and implementation process, staff found a number of information sources to be particularly useful in identifyirg commonalties and priority areas:

- The lists of occupations specific to broad fields of interest (e.g., earth/space sciences) listed in the School Subject Occupation Index (McKnight Publishing Company, 1978)

- The science concepts identified in A Framework for Science Programs (Oregon Department of Education, 1979) and the state's vocational cluster curriculum guides
- The planned course statements (goals and objectives) for each course, required by the Oregon State Minimum Standards
- Information about students' career interests and aptitudes--both general information, available through such references as the Guide for Occupational Exploration (U.S. Employment Service, 1979); and specific information, gathered using such instruments as the Interest Check List (U.S. Department of Labor, 1979), the Work Group Inventory (Oregon Department of Human Resources, 1984), and the General Aptitude Test Battery (G.A.T.B.)

As a result of their efforts, staff also have some valuable advice to offer about key "DO's" in developing an integrated program:

- **DO** provide staff and students with an opportunity for input.
- **DO** ensure that any survey used allows those responding to **elaborate** on their views.
- **DO** select the right teaching staff; this is the primary key to the success of the program. Involve teachers, on a volunteer basis, who are student-directed, knowledgeable, compatible, **enthusiastic**, flexible, and willing to try new ideas. Ensure that the planning/development process requires science and vocational teachers to work together as a team. Most important, ensure that neither group feels their subject matter is being diluted.
- **DO** appoint and involve a project advisory committee to ensure broad-based support for the program. The committee should include equal representation (three to four members each) from four groups: educators, students, citizens, and local employers/employees.
- **DO** remember that schools already have programs in place that, when combined, do not always emerge with different basic content, but perhaps with wider applicability. The integration of one curricular area with another does not necessarily imply that a district has to start over again in developing course goals and outlines. Schools can **restructure** rather than rewrite their current curricula.
- **DO** use materials already available--the vast curricular materials developed in response to state and school board mandates--to minimize the writing demands placed on the integrated program builders.
- **DO** structure the planning and development process, with activities documented in writing.
- **DO** state topics **initially** at a relatively high level of generality and keep them intentionally ambiguous. Consider listing concepts, instead of processes, skills, or attitudes. The more wide-ranging and flexible the topic, the greater the chance of developing an integrated instructional exercise; the more restrictive the topic, the more difficult it is to see the commonalties between areas.

- **DO** establish criteria for commonality based on factors unique to your own situation, including staff personalities (conflicts and compatibility), availability of facilities in a specific area, and most important, career goals and job interests of the students in the science program.

When asked about the benefits of the program, Dennis Crow, assistant principal and project director, responded, "We have developed a program that is almost a school within a school. There isn't a subject we can't teach in our Environmental Science class. It's a perfect alternative program for an alienated student, or a student who needs to be recovered for the system. It's also ideal for a serious science student!"

For More Information

Mr. Dennis W. Crow, Assistant Principal; Sandy Union High School District No. 2; 17100 Bluff Road; Sandy, OR 97055; (503) 668-8011

"A Step-by-Step Guide to Integrating Science Concepts and Vocational Skills in the High School Classroom: The Sandy Union High School Experience." Salem, OR: Oregon Department of Education, in press. For copies of this document, contact Dr. Alan Schultz, Specialist, Program Improvement and Data; Oregon Department of Education; 700 Pringle Parkway SE; Salem, OR 97310.

SAMPLE 17

COMPLETED TOPIC INTEGRATION ANALYSIS

TOPIC: Population

SCIENCE CLASS	VOCATIONAL CLASS
Taught In: Biology/Environmental Science	Taught In: Agriculture II
Teaching Strategy: The instructor will lead a discussion of population. He will ask students to define the term and write responses on the chalkboard. After a "consensus" definition has been derived, discussion will focus on density, control factors, and interaction of species.	Teaching Strategy: The instructor will physically demonstrate the process of evaluating destructive insects in alfalfa. He will discuss each step and clarify all questions. He will then show students how to use an insect sweep.
Demonstration of Student Knowledge: Students will explore specific sites using the field collecting procedures defined by the instructor, and identify specific populations. In a written report, students will relate the populations to biotic and abiotic factors.	Demonstration of Student Knowledge: Students will use the insect sweep to collect injurious insects in an alfalfa field. A record will be compiled of the insects found. Specimens will be examined.
Resources: Line transect, hoop transect, written methods of random sampling, scat boards, netting, processes of live trapping.	Resources: Insect sweep.

Identifier:_____

SAMPLE 18

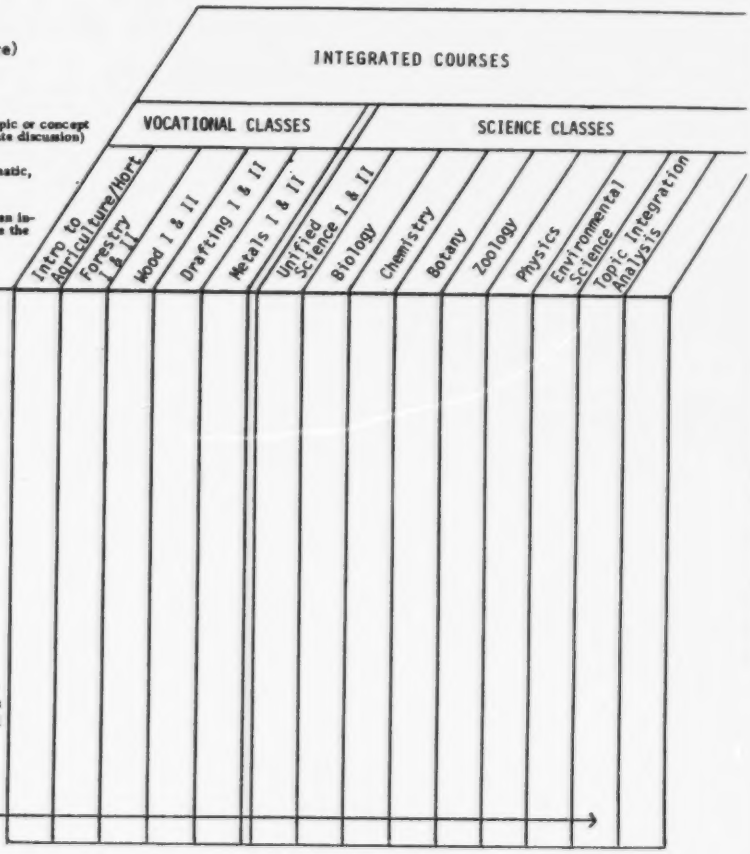
INTEGRATED PROGRAM GRID

GOAL: (goal statement to be written here)

I = Introduce (i.e., to bring topic or concept into use; to initiate discussion)

T = Teach (i.e., to provide systematic, formal instruction)

R = Reinforce (i.e., to strengthen instruction; to make the instruction more compelling)



This form can serve many purposes. Either objectives, concepts, or tasks may be listed. The appropriate courses should be marked with the above code. A related activity developed during brainstorming can be cross referenced here, using the identifier number at the bottom of the completed Topic Integration Analysis.

XVIII. ARTISTIC, PRACTICAL, & ACADEMIC LEARNING

Model Hibernia School, Herne, West Germany

Description

For a look at a single school, grades 1-13, with a total commitment to the integration and equal representation of three major components--artistic, practical, and academic learning--you may wish to read the following reference: Rist and Schneider, Integrating Vocational and General Education: A Rudolf Steiner School.

The school described is the Hibernia School in Herne, West Germany; and Rudolf Steiner's educational theory ("Study of Man") provides the foundation on which the school's pedagogical concepts are based. Formerly a factory training unit, Hibernia is now an integrated comprehensive school, which "replaces training for a specific occupation by fundamental education for lifelong education learning." Graduates receive dual certificates: a certificate of apprenticeship and a secondary school leaving certificate.

It is, of course, a private school, a German school, and an experimental school, and it sounds a little too good in its results to be true. Nonetheless, the article provides many suggestions with universal application and a great deal of food for thought. Consider the following excerpt:

> It was found that versatile practical and manual skill, combined with agile thinking, can considerably reduce the period of specific training. Although in the final school pattern approximately 70% of instruction time was devoted to "general learning" and only 30% to specific vocational education, the results of Chamber of Commerce and Industry examinations in vocational knowledge and skills were not inferior to those previously attained. On the contrary, they were slightly better--an unexpected outcome (p. 16).

Don't be tempted to misinterpret that excerpt; it doesn't mean that there is support for minimizing the role of secondary vocational education. To get the full picture, you need to read the whole article, but the point is the comprehensive articulation and **integration** of content--the **equal** representation of content. What their evidence does seem to do is offer an answer to those vocational instructors who fear that using "their time" to reinforce basic skills will produce only partially prepared workers. In fact, perhaps, an integrated curriculum may produce more thoroughly prepared workers--workers ready for **both** today and tomorrow.

More excerpts:

- This [program] development took place under the very critical eyes of the factory workers, the works council, the management and the parents (p. 16).
- When parents enroll their children in the Hibernia School, they learn that they are expected to cooperate. Their children should not be left to make their way through school alone but should be given a home education which is on similar lines (p. 43).

- The first step in the school's development from a factory training unit to the Hibernia School was the introduction of educational activities most unusual in a training program for future fitters, lathe operators, electricians, and chemical workers. They were taught watercolor painting; they rehearsed a play on an improvised stage; they talked about the structure of the earth in geology lessons; they studied skeletons in biology lessons to discover the difference between human and animal limb formations . . . .

  The present practice is an extension of this method. A 16-year-old future doctor . . . stands at a work-bench filing a joint for the hydraulic power-drive of a dredger . . . . What is the purpose of this combination of theoretical, artistic and practical education?

  Such variety of learning stimuli promotes an all-round expansion and individual development of the pupils in their thinking, feeling, and will; it leads to human maturity (p. 26).

- [Teachers] see themselves as . . . endeavoring to find answers to contemporary educational problems through practical application of Steiner's findings and methodological suggestions. . . . Teaching thus becomes a continuous learning process for the teacher as well as for the pupils. . . . The pupils, who see the teacher always adjusting his teaching to their needs, always learning, acquire an ability for lifelong learning . . . (p. 27).

- Recognition as an experimental school had far-reaching effects. For instance, the school was authorized to hold its own school leaving examinations. This enabled it to follow its educational principles to their logical conclusion.

  One of the basic ideas in the new examination concept was to give every pupil the opportunity of showing that he could do something. The examination--the preparation, execution and evaluation of which extended over several weeks--was in itself a learning process; self-evaluation and courageous self-presentation had to be practiced and perfected (p. 21).

- Human activity becomes economically and socially meaningful work when it satisfies human needs (p. 154).

- It is well-founded experience that such continuous interconnection has a very beneficial effect. Again and again it has been observed that adolescents, who enter the Hibernia School . . totally unwilling to learn, become interested in learning after a few months and make progress also, and especially, in academic learning areas (p. 166).

- A goal as comprehensive as this [providing students with an instrument for lifelong learning] cannot be reached merely by providing lessons. It requires a school organization entirely directed towards this end (p. 27).

Vocational-technical educators should be particularly interested in two sections: "Practical skills, usefulness and necessity are basic elements of technical education" (pp. 154-156); and "Possibilities of integrating theoretical and practical learning" (pp. 163-167). But it's also fun to hear about students' 5 km walk across the mud flats to the bird holm Norderoog to experience nature, apply their math and surveying skills, learn to work as teams, and cook for a large group (pp. 89-91). And no one should miss the opportunity to

find out how to harmonize children's natures--how to deal with the excitable sanquines, the melancholics, the indifferent phlegmatics, and the cholerics.

For More Information

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